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AUGUST 1998

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FEATURE: COLOUR  
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# Electronics Australia

with PROFESSIONAL ELECTRONICS & ETI

August 1998 Volume 60, No. 8

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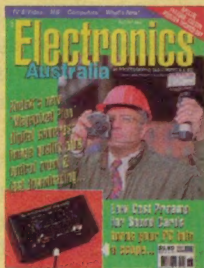
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Kodak's new DC260 digital still camera offers a 3x optical zoom lens with digital boost to 6x, plus a top image resolution of 1536 x 1024 pixels — enough for a photo-realistic 8" x 10" picture (see p.9). For more about our new sound card preamp, see Rob Evans' article on p.56. (Photos courtesy Kodak, Ben Granger)

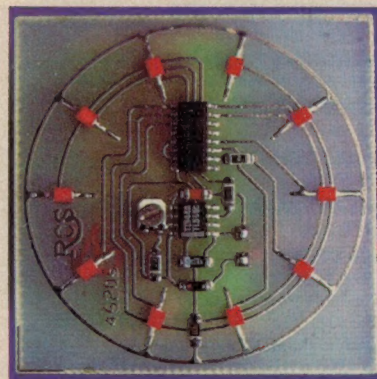


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# Letters to the Editor

## Help wanted

We are trying to find some information on where we could possibly get parts and a service manual for a three-gun video projector, made by an Irish company called VidePro International Products Ltd, Dublin II Ireland. The unit was manufactured for and sold by Bell & Howell Australia as a Bell & Howell Hi Beam 250. Manufacture date is 20 May 1986.

We have had absolutely no success with Bell & Howell as apparently they had some corporate changes etc. and no longer deal with or want to know about the projectors. Even their service department is no help. No luck finding VidePro International either. I think they've ceased to exist.

Can anyone possibly point us in the right direction?

*Craig Booker, PO Box 356, Newman WA 6753*

## Autodyne facts

While reading the Vintage Radio column in the April issue I kept looking for a footnote saying 'Please read on April 1st'. I refer in particular to the incredible alignment instructions for the autodyne superhet. In case some readers took this seriously I would like to try and set the record straight.

The autodyne is basically the same as any other superhet of that era. The alignment procedure is exactly the same as for other superhets. The article indicates the IFs can be peaked at any old frequency. This is nonsense. It is absolutely essential to peak the IFs to the manufacturer's specified frequency and obviously this has to be the first step. Any departure from this specified frequency will result in poor tracking and inaccurate dial calibration.

Tracking was a big problem with early superhets and in fact perfection was never realised until many years later, with the introduction of gang condensers with a specially designed smaller oscillator section. The best that could be obtained was perfect tracking at three points over the broadcast band. These were at approximately 600kHz, 1000kHz and 1400kHz. In between these three points tracking was close enough to give good performance over the BC band, usually 550kHz to 1500kHz.

Over the years since I started radio

service in 1939 I have encountered a number of autodynes and have never experienced any great difficulty in restoring these radios. Obviously all the leaking capacitors and resistors out of tolerance must be replaced, and of course after 60 plus years there are other components which should be examined. The coils must be in good order and original. The gang condensers are often damaged and should be cleaned up and readjusted as necessary. It is advisable to check each gang section for tracking by measuring the capacitance of each section every 30-40° of rotation. The sections should match within a few pF.

Incidentally some authorities recommend the oscillator be disabled when aligning the IF's in all superhets.

*Ted Baker, Bathurst NSW.*

## G-code 'a flop'

The G-code feature in my new Sony VCR has been a complete flop. Advertised programs starting as late as 37 minutes past the hour cut off the last seven minutes of the program, and this may include 'who dunnit'.

This problem is compounded by the locally received TV stations (all UHF) coming from Brisbane with relays from Sydney (NBN and Prime) with a one hour time difference during daylight saving (I live about 10km south of the Qld border).

Can you offer a solution to this situation — maybe other readers have an answer, or is G-code great technology out of step with the real world?

*Dave Jeanes (via e-mail).*

## Power outlet safety

I refer to J. Johansen's letter (EA March 1998) stating that electrical outlets cannot be oriented any other way than with the earth pin at six o'clock etc. AS 3000 4.14.8 states:

*Polarization. GPOs and 10A, 15A and 20A socket-outlets designed to accommodate flat-pin plugs to Fig.2.1 (a) of AS 3112 shall be connected so that when viewed from the front of the outlet the order of connection shall be Earth, Active, Neutral in a clockwise direction.*

Fig.2.1 shows the dimensions of various socket outlets. This rule is for



wirable outlets as it was once allowable to have Earth, Neutral, Active.

If there is a rule in AS 3000 to prohibit mounting of a socket on an angle, then that ain't it. We all have local authorities and inspectors who put their interpretations on these rules. What I would like to know is why would the active pin 'easily break last' just because the socket is mounted on an angle? We have to rely on the design of the socket to prevent incorrect insertion.

How do you control the orientation of outlets on extension cords, power boards, pendant sockets etc? They are all fine as long as they comply with the above rule.

Alan Morcom, Geebung Qld.

## Laser Pointers...

I am writing about my concern of the growing misuse of laser pointing devices, since such devices can lead to eye damage.

Recently I was surprised to find an advertisement in the *Sydney Morning Herald's* Domain section for such devices, with no indication of how dangerous they can be. Instead, the ad seemed to be targeted at anyone wishing to 'show off' such a device.

Sending in a complaint about the advertisement disappointingly yielded no response. Since my eyesight has been damaged by light from a laser pointer (fortunately, not seriously, but still enough to be upsetting), I feel that more attention should be drawn to the subject.

I think most people are fascinated by the properties of laser light, but they have little notion of just how dangerous it is to their eye-sight. Even when the beam may not look very intense, serious eye damage can still occur (since our eyes may not be totally responsive to the wavelength of light from the laser).

I thought that if the editors at the *Sydney Morning Herald* do not understand, perhaps you and your readers might.

Paul Graham, North Ryde NSW. ♦

Letters published in this column express the opinions of the correspondents concerned, and do not necessarily reflect the opinions or policies of the staff or publisher of Electronics Australia. We welcome contributions to this column, but reserve the right to edit letters which are very long or potentially defamatory.



## DVD: let's not repeat the mistakes made with laserdiscs!

before they feel justified in releasing and stocking too much 'product'. But this is exactly the kind of market where a fair amount of 'priming' is necessary, before critical mass is reached. Without a good initial range of appealing movies, at attractive prices, DVD could easily end up being stillborn here — following exactly the same path as PAL laserdiscs, and for almost exactly the same reasons...

With laserdiscs, you may recall, it was decided that the Australian market would be offered only PAL players and software, despite the fact that most modern TV sets will happily display NTSC as well. The nett result was that Australian consumers were asked to buy more expensive 'special market' PAL players, and effectively denied access to the large range of NTSC software available overseas at attractive prices. Instead there was only ever a limited range of relatively expensive software, and quite understandably most consumers simply walked away.

Why do I say there's a risk of replaying this scenario with DVD? Simply because in their desire to maximise profits, the software producers have decided on their 'regional coding and release' system. So again, Australian consumers find themselves denied access to the much larger range of newer movie titles available in the big US market ('Region 1', not surprisingly) and having to wait until titles are finally released here ('Region 4') — and at higher prices, almost inevitably. Sound familiar?

About the only feasible way around this 'vendor's market' situation is for consumers to get a friend in the USA to buy them a Region 1 player and ship it to them, so they can import US discs by mail. But as with laserdiscs, this will simply not be feasible for most people...

So despite the clear and undeniable technical advantage of DVDs as a medium for presenting high-quality movies in the home, and the availability (now) of reasonably priced DVD players, there's still a chance that in the Australian market, DVDs may never take off — unless we see the release of a lot more attractively priced software, and quickly. The goose may be killed off before it lays any golden eggs at all.

Are you listening, software producers and distributors?

**Jim Rowe**

**A**fter much previewing and marketing hype, it looks as if 1998 just *might* be the year when Digital Video/Versatile Discs finally 'take off' in the Australian consumer market. At least the main hardware manufacturers have released their 'serious' models and have encouraged some of the retailers to stock them...

At this stage, though, there seems to be only a miserably small selection of software available. As I write, there's about 12-14 movie titles — if you hunt around, and none of them is what you'd call a 'blockbuster'. It's a tiny fraction of the selection I saw available a couple of months ago in California (in a neighbourhood video store). And when you consider the range of movies available here on VHS videotape, it's absolutely pathetic.

The initial prices for the software aren't looking all that attractive, either. It's pretty clear that consumers are being expected to pay a significant premium for the DVD version of a movie, compared with the VHS version — despite the fact that the actual cost of production must be lower, if anything.

Yes, I know this is early days, and in a new market the software producers need to be assured that there's a reasonable number of hardware owners out there

before they feel justified in releasing and stocking too much 'product'. But this is exactly the kind of market where a fair amount of 'priming' is necessary, before critical mass is reached. Without a good initial range of appealing movies, at attractive prices, DVD could easily end up being stillborn here — following exactly the same path as PAL laserdiscs, and for almost exactly the same reasons...

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Are you listening, software producers and distributors?



# WHAT'S new

in the ever-changing world of electronics

## New photo printer from Olympus



Olympus has introduced its 'second generation' personal photo printer, the P-300E. It's claimed to be both easy to use and fast, providing consumers with high-quality instant prints directly from all Olympus digital cameras, with or without a computer.

Output quality approaches that of conventional photographic prints.

The P-300E provides continuous tone colour for high quality digital photos, previously only available using printers costing many times more. It's a 300dpi, photo quality

dye-sublimation colour printer, with a resolution said to be equivalent to 2400dpi resolution on an ink jet. It prints on a 100 x 140mm (A6) page at a rate of 95 seconds per page, in true 24-bit colour with 16.7 million colours.

Measuring 274 x 362 x 73mm, the P-300E prints directly from any Olympus digital camera, or from a computer through the serial (Macintosh) or parallel (Windows) port for users who want to retouch and manipulate an image before printing. It can automatically print up to 30 reprints of the same photo such as baby pictures or family gatherings, or 30 prints of different photos without reloading.

Approximate RRP for the P-300E printer is \$999.00, with a P-60E paper set (includes 60 paper sheets and ribbon cartridge) available for \$59.00.

For more information circle 140 on the reader service card or contact R. Gunz Photographic, Locked Bag 690, Beaconsfield 2014.

## 'Master & slave' subwoofers from Sonique

South Australian manufacturer Sonique Audio has improved the performance of its SAV-SUBS Subwoofer, and also given it the ability to run a second subwoofer. The only visible difference to the unit is the addition of a high quality Neutric connector on the rear, but inside is circuitry providing greater dynamics, the ability to deliver greater SPL's, more weight and even deeper bass.

Built into the Master Subwoofer is a high power MOSFET amplifier featuring Auto Power On and built-in protection for the Master or Master/Slave combination. The optional Slave unit is connected to the Master by a 'smart interface cable' that modifies the Master's amplifier to match and drive the Slave unit. The Slave unit is identical in size and appearance to the Master, with just one single Neutric connector on the rear for connection to the Master.

This design concept allows the convenient and cost-effective addition of a second fully matched Slave subwoofer unit at any time, to effectively double low-end performance.

The new improved SAV-SUBS Master

Subwoofer has been reduced to just \$1799.00, while the optional Slave unit is only \$699.00 extra. Owners of the original SAV-SUB1 subwoofer can have their units upgraded to current Master specification

for just \$195.00 + freight, when buying an additional slave unit for their system.

For more information circle 142 on the reader service card or contact Sonique Audio, 14 Kindale Court, Pooraka 5095.





## Award-winning speaker system from B&W

UK loudspeaker manufacturer B&W has recently been awarded two major industry awards for its Solid Solutions Loudspeaker system: The '1997/98 Sound & Image Packaged Home Theatre Speaker System up to RRP \$2999' award and the '1997/98 EISA European Home Theatre Loudspeaker System' prize. Both awards were on the basis of both styling and performance.

The Solid Solutions range is designed to provide high quality home cinema and hi-fi sound without the need to display an array of space-consuming black boxes. It combines three products: the S100, a small but powerful front and rear monitor; the C100, the dedicated centre channel; and the PB100

active subwoofer.

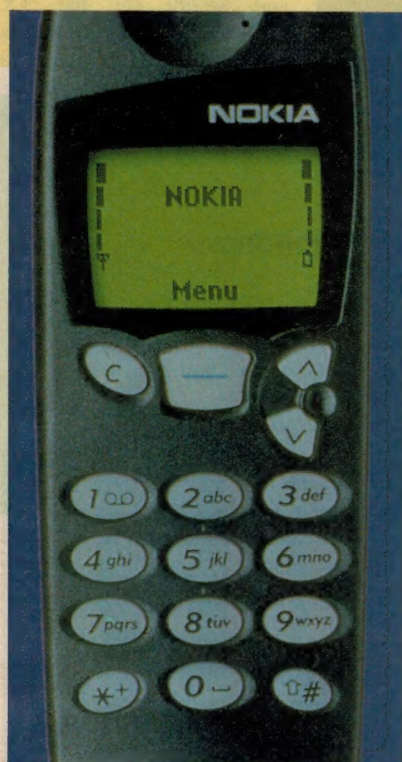
The ultra slim S100 monitor has been designed to be used in any room of the house. Its integral, multi-purpose wall bracket gives the utmost flexibility to allow the speaker to be mounted either way up, directly in the corner of the room, or on the wall. Alternatively, the speaker can be used as a bookshelf monitor or mounted on its dedicated stand.

The stylish PB100 is a compact active subwoofer designed to deliver deep, low-frequency sound, while the compact C100 centre channel is claimed to produce stunning reproduction of on-screen dialogue and effects while maintaining a discrete profile.

All three products are available as separates, with the PB100 retailing at \$599, the



C100 at \$299/each and the S100 at \$369/pair. For more information circle 148 on the reader service card or contact distributor Convoy International, Unit 7, Discovery Cove, 1801 Botany Road, Botany 2019.



## Nokia cellphone has simplified keypad

Nokia's new 5110 cellphone has been designed with simplicity in mind, allowing the user to access all the phone's functions through one key — the Nokia 'Navi' Key. This is claimed to make the phone much easier to use. Using the Navi Key a user can access all the features of the Nokia 5110 via an icon-based menu system, read through the large graphics display.

For those who must have their cellphone colour matched to their outfit or moods, the 5110 also offers the ability to change its 'Xpress-On' coloured covers. There's a range of coloured covers available, including 'groovy' metallic shades such as Tango Orange and Bermuda Blue. The covers can be changed by the user in a few seconds, without any special tools...

The Nokia 5110 also comes complete with built-in games: Snake, Memory and Logic, claimed as 'a perfect way to pass the time in the back of a taxi'. It weighs 143 grams including slim 3V battery, which provides up to five hours of 'talk time'.

## New digital still camera from Sanyo

Sanyo has released a new digital still camera, the VPC-X300, featuring a removable SmartMedia memory card which can be replaced when filled with images.

The controls of the VPC-X300 are well laid out and simple to use. Image quality is

claimed to be excellent, thanks to a CCD sensor with 810,000 pixels that delivers XGA (1024 x 768) or VGA (640 x 480) images. A built-in LCD monitor allows you to view the pictures you have taken immediately, while a 3x digital zoom lets you close in on subjects in six steps. The multi-playback function means you can view nine pictures at the same time in order to quickly review memory contents and select the images you require.

Other features include macro focussing as close as 20cm, and the ability to automatically record a sequence of events at spaced intervals of either 0.1 or 0.2 seconds. The interface cables and software included with the camera let you conveniently transfer images to a computer, a VCR or a TV set.

The VPC-X300 retails for \$1399 and is available from all good camera stores and electrical appliance stores.





# WHAT'S *new* in the ever-changing world of electronics

## Big screen CTVs use rear projection

Panasonic has added two new models, a 130cm (TX-51GF85H) and a 109cm (TX-43GF85H), to its range of rear projection television receivers. Rear projection large-screen CTVs are growing in popularity with Australian consumers as home theatre systems become the latest 'must-have'.

The new models are manufactured in Japan with advanced picture and sound technology. A new screen technology is said to deliver the highest possible contrast for clear, realistic images even in a brightly lit room. The sets have a horizontal viewing angle of 160° and a vertical viewing angle of 72°.

The circuitry features a twin digital comb filter and digital convergence, claimed to virtually eliminate cross-colour distortion and colour misalignment — resulting in consistent picture quality with accurate, well-defined images.

The TX-51GF85H has a total sound output of 36 watts from three speakers — left, right and centre. The two new models



also have three preset sound modes of stadium, hall and cinema to match different TV programs and video software.

Both new models have two tuners so two programs can be watched at the same time using the picture-in-picture feature.

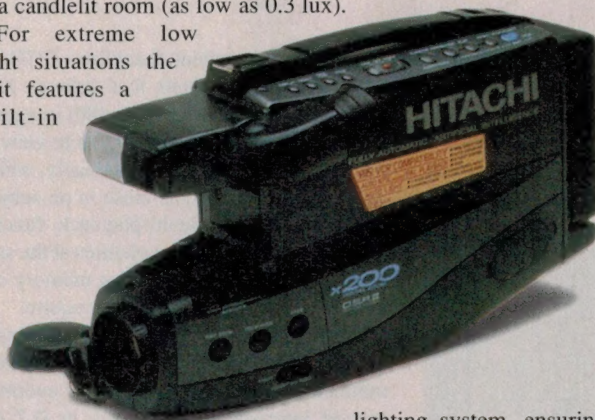
The two models are available from leading electrical retailers for an RRP of \$7999 for the TX-43GF85H and \$8999 for the TX-51GF85H. For more information circle 145 on the reader service card or contact Panasonic's Customer Care Centre on 132 600.

## Return of the 'full size' VHS camcorder

Hitachi Australia has released their new 'full-size' VHS Camcorder, featuring increased zoom range and low light ability at a new low price point. The new model VM7380E is specifically designed for those users wanting the convenience of being able to replay full size VHS tape on a standard VCR without having to dub or use an adapter.

Features of the new recorder include a maximum zoom of 200x to get closer to the action, an f/1.4 lens with a focal length of F4 - F64 and a built-in title making facility. The new lens now has the ability to capture images in very low light conditions such as that in a candlelit room (as low as 0.3 lux).

For extreme low light situations the unit features a built-in



lighting system, ensuring a perfect picture without the hassle of remote lights and messy cords. It also features a sturdy high-impact carry case to better protect the camera when travelling.

The Hitachi VM7380E is available now from quality resellers around Australia, for an RRP of \$1899 complete with light and case. For more information circle 147 on the reader service card or contact Hitachi Australia, 13-15 Lyonpark Road, North Ryde 2113.

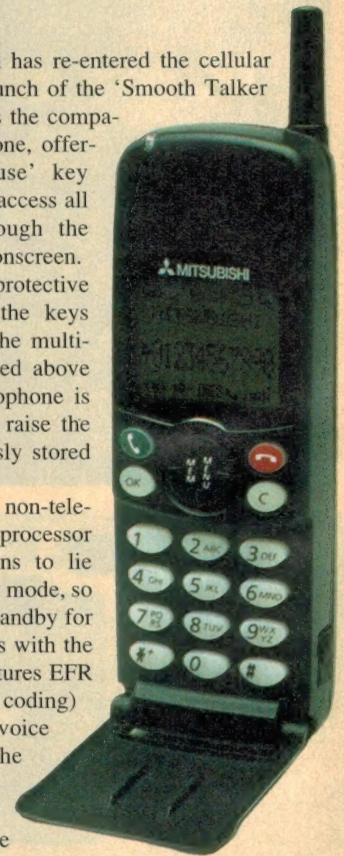
## 'Smooth Talker' cellphone from Mitsubishi

Mitsubishi Electric Australia has re-entered the cellular telephone market with its launch of the 'Smooth Talker Thirty' digital phone. This is the company's first digital cellular phone, offering a multi-function 'mouse' key which allows users to easily access all functions by scrolling through the menus and moving a cursor onscreen.

Another feature is a flip protective key cover which protects the keys from accidental use. Since the multi-function mouse key is located above the flip cover and the microphone is outside, there is no need to raise the flip in order to call previously stored numbers.

The antenna is short and non-telescoping. An advanced microprocessor allows the memory functions to lie dormant when it is in standby mode, so that the unit can remain on standby for up to three days (or five days with the extended battery). It also features EFR (Enhanced Full Rate speech coding) which allows for improved voice quality, compatible with the requirements of the digital GSM networks.

For more information circle 144 on the reader service card or contact distributor Roadhound Electronics on (02) 4956 6666.





## Still more digital cameras from Kodak



Never one to rest on its laurels, Kodak has released two further digital still cameras: the Digital Science DC220 and DC260. They're claimed as the first models to offer the Universal Serial Bus (USB) interface, for transferring images at least 10 times faster from the camera to a computer.

Both models employ a Motorola PowerPC 800 series processor to speed image processing and add functionality — including the ability to customise camera operation via the Flashpoint Digita operating environment. Each camera also provides high quality million-plus pixel image capabilities, the DC260 being the first in its class with a maximum setting of 1.6 million pixels (1536 x 1024). This is enough to capture a photo-realistic 8" x 10" picture.

Other features of the cameras include a 50mm colour LCD screen for picture monitoring, a choice of either JPEG or Flashpix image formats, 'burst' mode for rapid image capture and video output for connection to a TV or video monitor. The DC260 also offers a 3x optical zoom with digital extension to 6x.

The cameras ship with 8MB memory card, with 4MB, 10, 20 and 32MB cards available as optional accessories.

**PIONEER** says the main innovations in its new 'A Series' of mini hi-fi systems are in the technology inside. Features include Sound Morphing, increased power output, improved CD performance and Linear Power speakers. There are six models in the new series, from the A-100 to the A-800.

Sound Morphing is described as the 'ability to shape sound', in near-continuous, fine gradations. Five morphing modes with 40 steps allow you to cycle continuously

## Remote 'PDA' for Sony's PlayStation

Sony Computer Entertainment has previewed a new portable miniature videogame and information unit (currently code named Personal Digital Assistant or PDA), which seems to be designed as a 'slave' to the company's existing PlayStation game console.

The unit will apparently sell for around US\$30 when it's released late this year or early next. It plugs into the PlayStation's existing memory card slot, and can download game or other information for recreation and enjoyment 'on the road'.

An interesting feature is an IrDA infrared communications ability, which will allow two of the PDAs to exchange information for interactive gaming without having to involve the PlayStation console. The unit will also be able to download message data, scheduling and calendar/clock information.

Inside the PDA is an ARM7T 32-bit RISC processor, with 2KB of SRAM and 1Mb of flash RAM. It uses a 32 x 32 mono-



chrome LCD and a small dynamic speaker (10-bit PCM sound).

## Mini hi-fi systems offer 'Sound Morphing'



through flat, soul, rock, hip hop, and techno modes. Also featured are 20 bass boost steps, 10 stereo width steps for three modes, and three modes to let you combine EQ, bass boost, and stereo wide settings.

The flagship A-800 model features a Multi Amp Bass System, which offers 120 watts RMS/channel to drive the woofers and a 20W RMS/channel amplifier to drive the tweeters. This 'biamp' design results in

cleaner overall sound since each speaker has its own amplifier and no crossovers.

The A-Series hi-fi mini systems are available at Pioneer dealers throughout Australia at RRP figures ranging from \$999 for the A-800 to \$499 for the A-100. For more information circle 141 on the reader service card or contact Pioneer Electronics Australia, 178-184 Boundary Road, Braeside 3195. ♦



# Pioneer's DV-505

## DVD/Video CD/CD Player

**1998 is certainly turning out to be the year in which DVD players finally made it onto the market — along with a modest amount of software. Here our reviewer Louis Challis looks at the new Pioneer DV-505, of particular interest because it's the first DVD player to break the \$1000 price level in Australia.**

**P**ioneer's DV-505 is the latest and most sharply priced entry into the DVD Player market. Although Pioneer have opted for a selling price which is approximately two-thirds that of most of its competitors, don't let the price fool you into thinking that this is a cheap or shoddy example of this new technology. It's not.

On opening its shipping carton, I was surprised to observe just how light the DV-505 is. As a result, one of the first things I did was to open its case, to find out why!

As I had half guessed, the DV-505 is based on the use of second-generation LSI (large scale integrated) circuits. Pioneer has a fundamental advantage over many of its competitors, as a direct result of that company's involvement in advanced laser/optical disc technology for most of the last decade...

At first glance the DV-505's primary claimed features appear to be almost identical with their competitors' more expensive DVD players. They include multi-angle capability, which allows you to view scenes from different camera angles (provided of course that they are encoded on the disk); Virtual Dolby Surround Sound, based on SRS TruSurround sound; GUI (graphic user interface) On-Screen Displays; Parental Level Control, with two types of possible play back depending on the disk; Last Memory Play which allows you to stop watching a video in the middle with a later restart at precisely the same place; Multi-Aspect Display for regular, wide angle or letterbox formats; and selectable standard, cinema mode, or animation mode video quality, supplemented by a wide range of repeat play options.

In keeping with the current design

trends, there are only a limited number of functional controls on the DV-505's front panel. In order to achieve comprehensive control of all the DV-505 multiple functions, one is forced to use the CUDV008 Remote Control. Although this 'remote' provides optimum control flexibility, its designers appear to have ignored what I view as being a fundamental ergonomic

issue. The 43 buttons on this remote are relatively small, and the designers seem to have forgotten that this remote has to be used in a partially illuminated room. *You* might find it easy to use, but I do prefer a more pragmatically designed remote with more widely spaced keys as typified by Pioneer's CU-CLD071, which came with my Pioneer laserdisc player.

The DV-505's back panel is better equipped than I might have imagined. It incorporates numerous sockets which provide multiple interconnection options. These include a digital coaxial output jack and an optical output jack for feeding signals directly to Dolby Digital compatible components (i.e., a five- or six-channel amplifier with decoder). Also included are an S-Video output jack and conventional stereo audio and analog video output jacks. In addition Pioneer has also included a Pioneer control input jack, plus a SCART socket which facilitates integrated audio and video connections to continental and most Japanese equipment...

The back panel also incorporates a three-position selector switch for NTSC, PAL or automatic system selection. It also has a two pin non-polarised mains lead socket.

The DV-505 incorporates one very desirable feature. It accepts any AC supply voltage between 100 and 240 volts, whose frequency may be either 50 or 60Hz frequency without further adjustment. As my secretary would say, "that's very cool!"



**The remote that comes with the DV-505. The keys are a little small and closely spaced — making operation somewhat tricky in dim light.**





## On the bench

The DV-505's main attributes are immediately visible as soon as you load it with a quality Digital Video Disc. Having satisfied myself that the unit was fully functional, I placed it on the bench in my laboratory and evaluated its most critical performance parameters.

I rapidly discovered that its frequency response, when evaluated as a conventional CD player, displayed a response that was ruler-flat from 5Hz to 2kHz, with a gentle rise of +0.4dB in the 8-12kHz region followed by a comparable drop of -0.4dB at 16kHz, with a further drop of -2dB at 20kHz.

Pioneer's design and marketing teams have adopted what I regard as an extremely pragmatic approach to an issue with which many other companies have had trouble in coming to grips with. Instead of providing a sharp filter or a filter comparable to that adopted by the Sony DVP-S715, Pioneer provide a filter which emulates the best characteristics of the Legato Link System which we reviewed in *EA* in December 1992, and avoids the generation of those nasty artefacts that most other filter systems tend to create. The result is an extremely clean audible output which although not quite as flat as say the Sony DVP-S715, has outstanding attributes nonetheless.

The measured signal to noise ratio

## Pioneer DV-505 DVD Player

A 'second generation' DVD player, also capable of playing conventional audio CDs, video CDs and 24-bit/96kHz PCM audio discs.

Measures 420 x 284 x 104mm, weighs 3kg.

**Good points:** Significantly lower price than competing products; excellent video and audio performance. Full range of outputs.

**Bad points:** Remote control buttons a bit fiddly; performance not quite as good as the higher priced models, but this is really only evident on test instruments.

**RRP:** \$999

**Available:** Pioneer dealers, or contact Pioneer Electronics Australia, 178-184 Boundary Road, Braeside 3195.

exceeds 105dB, and the dynamic range is a genuine 96dB. The DV-505's digital to analog conversion linearity is excellent, all the way down to -95dB. However below that level non-linearity immediately becomes evident. Of course although such non-linearity is measurable and is quite apparent in our the attached fade to noise graph, any differ-

ence between this parameter and that provided by other more expensive DVD players is purely academic.

When subjected to the black dot and more critical black wedge tests on our Sony/CBS test disc, the DV-505 performed well, with audible clicking only becoming evident when wedge widths were greater than 300 microns. In like manner, the performance of the DV-505 on our shaker table test revealed good performance up to 0.3G — which was the threshold level for mis-tracking.

The frequency accuracy of the DV-505 was also excellent, with a maximum frequency deviation of only -0.3Hz at the 19.999kHz test frequency.

## On the big screen

I took the DV-505 home and was fortunate enough to have available an NEC PlasmaSync 4200W 42"-wide Plasma Monitor, supplemented by a Harmon-Kardon AVR85 Audio/Video Receiver plus a full complement of JBL speakers for the normal five channels of the Dolby Digital Sound System, and also a B&W ASW1000 Active Subwoofer to round off the 5.1 channel system.

When describing a DVD system's attributes, most other local journalists have focussed their attention on the system's audible attributes. That's OK as far as it goes, but I now



## The Challis Report

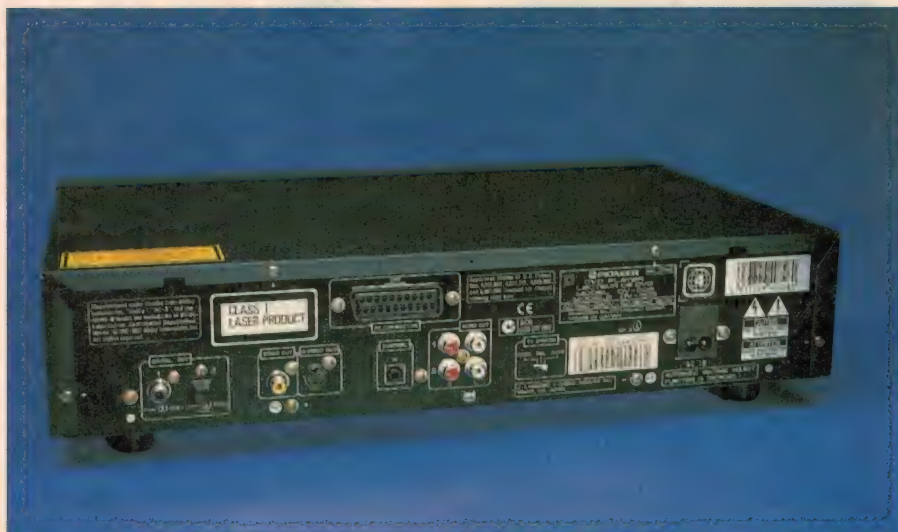
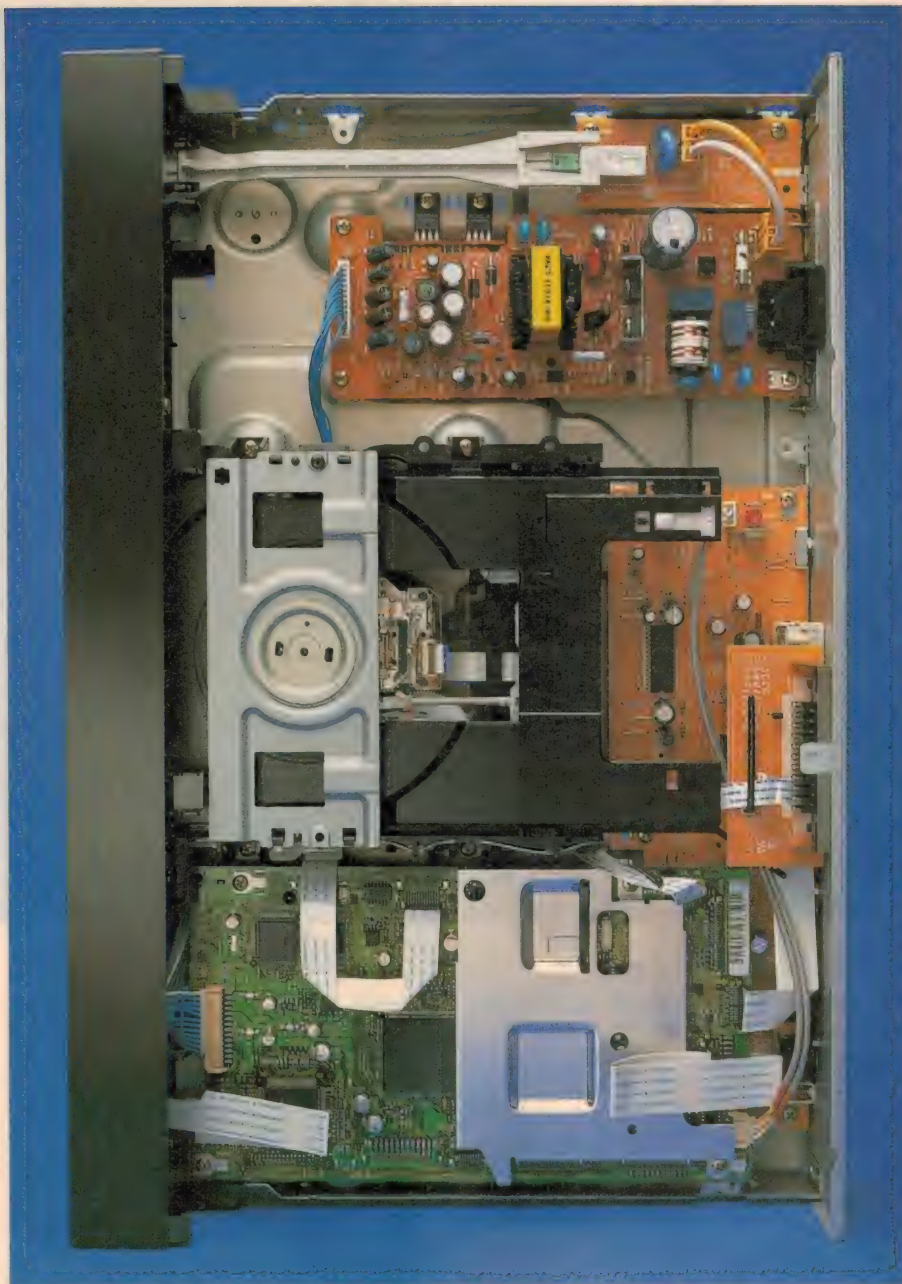
*Inside the DV-505: there's plenty of room, thanks to the use of second-generation VLSI chips for the signal processing.*

suspect the other journalists have all suffered from the same deprivation problem that I suffered from. I suspect we were all restricted to a conventional TV set or monitor which had been lent to us by an obliging supplier, or were restricted to the TV set of TV monitor we already owned...

In my case all prior concepts, perceptions and viewpoints that I may have held about the relative significance and relationships between the video and audio components in a DVD-based home video system were instantly discarded, and effectively disposed of in my mind's WPB, when my family and I viewed the NEC PlasmaSync 4200W Plasma Monitor. When coupled to the Pioneer DV-505, I experienced the most wonderful and exhilarating home cinema experience imaginable. I was instantly convinced that the video systems with which I have become reconciled are simply *passee*!

The first DVD video I looked at was Columbia Tristar Home Video's *Home and Away*, which was simply brilliant — with a picture that was crisp and whose images were unbelievably natural. The actors' skin hues and other natural colours were true to life. They were so realistic that you felt you could simply put your hands out to touch them. What I hadn't realised was that a 42" wide Plasma Monitor in my living room could change my perceptions (and more critically that of my wife's) so dramatically, as it did during those few brief nights of viewing...

We progressed to two other new releases



from Columbia Tristar, *Jumanji* and *A Few Good Men*, which were equally outstanding, with brilliant 5.1 channels of DVD sound amplification. This was then followed by Village Roadshow's *Dumb and Dumber*, which although not quite my scene, provided excellent viewing. All of these DVDs were elevated into a new visual dimension by the NEC PlasmaSync 4200W, which in the end simply 'blew us away' in the visual sense. After I reluctantly returned the PlasmaSync 4200W (after a brief weekend's loan), I realised just how much visual advantage it could provide when compared with the tried

*At the rear, there's a full complement of I/O connectors — including both digital and optical bitstream outputs.*



and proven conventional video display to which we have all become reconciled.

It was at that point that I connected up the DV-505 as a conventional CD Player and played two new CD albums. The first was Yo-Yo Ma and Emanuel Ax in *Beethoven's Five Cello Sonatas* (Sony Classical S2K42446), which is highly recommended by the Penguin Guide. This was followed by Cho-Liang Lin and Paul Crossley playing *Debussy for Violin and Piano* (Sony Classical SK66839), both of which provided exceptional listening pleasure because of the quality of the playing and the recording.

Although the DV-505 is currently the least expensive DVD player on the market, notwithstanding it still proved to be an outstanding CD player. What that ultimately means to you is that by buying this one item of equipment, you ably fulfil two critical home entertainment tasks and end up with a purchase that constitutes true 'value for money'.

When we accepted the DV-505 for this review I had no preconception of just how much pleasure it could provide. When coupled to an outstanding and thrilling plasma video monitor like the NEC PlasmaSync 4200W, the word pleasure was instantly replaced by ABSOLUTE EXCITEMENT! Incidentally, a dickie bird has whispered in my ear that Pioneer are contemplating the release of their own plasma display on the Australian market. If and when that happens, take a leaf out of my book and nip into the nearest Pioneer retailer, to experience what I hope will prove to be the same level of visual excitement that I've just experienced.

## Postscript

The day after I finished the above review, I was lent a Panasonic DVD Test Disc incorporating a linear 24-bit 96kHz PCM signal containing recorded music. The desire to confirm the DV-505's ability to cope with that 24-bit/96kHz audio material got the better of me, so I took the disc and player home again to evaluate their compatibility.

For the evaluation, I used my normal CD test amplifier and B&W 801M reference speakers, supplemented by a real-time analyser to sequentially monitor the electrical and acoustic signals.

The results were promising, as I was able to detect electrical signals above 20kHz; but only marginally so. Although the music was clean, sharp and well defined, it was not markedly nor audibly superior to what I would expect from a well recorded CD, using the conventional 44.1kHz sampling frequency.

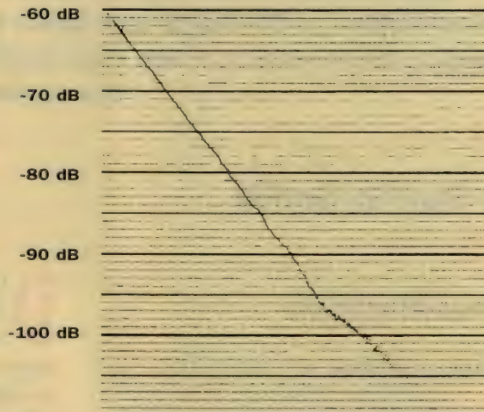
What is important is that the DV-505 is technically ready and most certainly able to replay the 'next generation' of 24-bit wide-band PCM audio discs with a 96kHz sam-



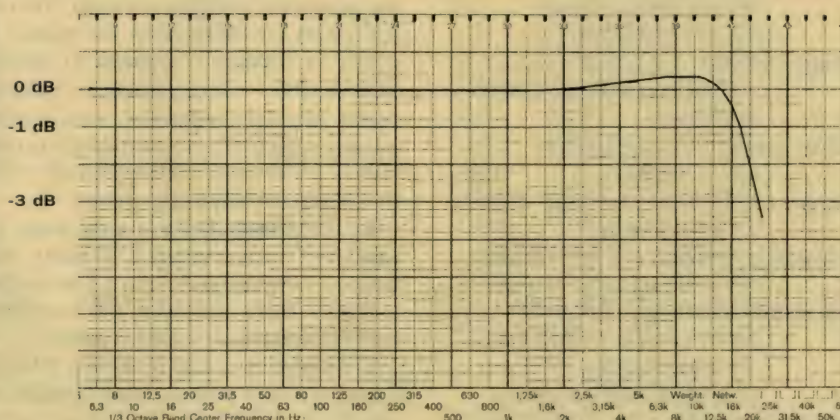
*The NEC PlasmaSync 4200W plasma monitor. When Louis Challis saw the output of the Pioneer DV-505 on a borrowed 4200W, its outstanding 42" wide screen display 'blew him away' and changed his attitude to DVD forever...*

*Right: the fade-to-noise plot for the DV-505. Linear down to -95dB, it's only academically inferior to the more expensive models (you can't hear the difference). Below is the replay response when playing an audio CD — very impressive indeed.*

## Fade To Noise Test



## Replay Frequency Response



pling frequency.

The only catch is that currently there is only one commercially released disc available in Australia with a 96kHz sampling fre-

quency. It's also my observation that the music industry has not yet resolved whether it wishes to adopt yet another divergent recording standard. ♦



# Canon's MV100:

## small, but nicely formed...

Canon's new MV100 is a hot little box of video tricks — a DV digital camcorder with a few nice tweaks and touches that should stir the opposition.

by Barrie Smith



### Specifications

**Video recording:** 2 rotary heads, helical scanning system  
**DV system:** Consumer digital VCR SD system, digital component recording  
**Audio recording:** PCM digital sound 16 bit (48kHz/2ch) or 12 bit (32kHz/4ch)  
**Image sensor:** 1/4" CCD with 470,000 pixels (304,000 effective)  
**Tape speed:** SP 18.81mm/s; LP 12.56mm/s  
**Lens:** F/1.8-2.5/11x power zoom (3.9 - 42.9mm)  
**Focusing system:** TTL autofocus, manual focusing possible  
**Minimum focusing:** 10mm with zoom at wide angle; 1m at the intermediate zoom/telephoto position.  
**Shutter speeds:** 1/50 - 1/8000 sec.  
**Recommended illumination:** More than 100 lux (minimum 4 lux using the Low Light illumination program).  
**Microphone:** Stereo electret condenser microphone.

**D**igital video cameras now proliferate from a number of manufacturers, but looking closely at Canon's video offerings over the last few years you would have to admit that smallness has not been a high priority in their designers' list of options.

By contrast, companies such as Sony and JVC have grasped the nettle of miniaturisation with alacrity, by offering models teetering around the half kilo in weight. Yet each still offers all the goodies the market — rightly or wrongly — appears to demand: LCD screens, image stabilisers, extended zooms (digitally augmented even further), integral comprehensive digital effects capabilities, PCM sound and connectivity to PCs for editing and still frame capture.

By comparison, Canon's most recent DV camcorder series suffered seriously from bloat — weighing in close to a kilo, and presenting a bulky body that was unarguably hard to handhold for extended periods.

At 530g (minus batteries), the new MV100 is a small and very different beast. Diminutive it may be, but it still offers a power pack of features: DV format, offering 500+ lines of horizontal resolution; an optical 11X zoom (plus 44X digital boost); an electronic image stabiliser; use of the IEEE 1394 standard for input/output (otherwise known as Firewire), via a single cable transfer of video and sound; a 2.5" LCD screen of 180,000 pixels that swings through

180° — so you give the subject a face-up display as they are shot; PCM digital sound (in either 16 or 12 bit); digital Photo Mode, capturing 500 still pictures on a 60-minute tape (running for six seconds each); Program AE; a tough magnesium alloy body; seven digital effects — and, thankfully, manual focus and exposure controls as a bonus. The battery power uses rechargeable Lithium-Ion cells.

Other options include a useful LP shooting mode, which extends recording time by 1.5X and reduces picture quality only marginally. Time code is installed.

The kit includes a neat and very impressive docking unit which allows output of a composite or S-video signal, L+R audio channels, a mike input and LANC control for outboard editing controllers. The docking unit has the same footprint as the camera, and is only 23mm high.

### Pleasing layout

When new, the camcorder has an attractive matte silver facade, backed by the usual dark grey casing to the rear. One downer on this otherwise visually pleasing arrangement is that, although the camcorder is built around an internal magnesium alloy body, the silvery polycarbonate front skin soon becomes scruffy from wear and tear.

External control points are few — no more than a dozen — whilst most modes are con-



trolled and selected via an internal menu system displayed on the LCD screen.

The top surface houses the main power switch — a sliding toggle which moves through a scant 7mm to allow selection of four functions: off, replay, shoot in manual and shoot in Program mode. This irritating, minuscule control point alone could well be a 'turn off' feature and antagonise many potential owners.

Close beside this control is a two-position switch which takes the camcorder from full motion video shooting to still frame capture mode — a recurring feature in digital video camcorders, as they attempt to occupy a little of the territory claimed by digital still cameras.

At the right corner of the top surface is a large red button, which fires the camera; over on the opposite corner is found a novel control for manual focus or exposure adjustment — a powerful feature. In the Program setting you can ignore the auto setting and manually adjust focus right through the range; similarly, exposure can be tuned by an estimated three f-stops (up or down) from the preset exposure.

The inbuilt stereo microphone, behind a 20 x 10mm honeycomb baffle, is set into the top surface — pointing skywards; one can only wonder at the mindset of a designer who pens a layout for a camera, equipped with stunning PCM sound, that calls for an omnidirectional mike capturing at 90° to the subject before the lens! Prepare to collect crystal-clear pickup of overhead wildlife and aviation activities...

As is the way with many electronic Japanese devices these days, a 'world clock' function is provided — so that travellers can imprint the local time onto the video. A self-timer is also provided, triggered by delving into the screen menu options.

## Menu operation

Called up easily — by pushing a button on the camera's rear — the menu options can be simply selected.

Any shutter speed can be chosen between 1/50 and 1/8000 second — useful for those who wish to analyse sports on slow replay. However one missing option we thought would have been valuable was the ability to fine tune the speed so that computer screens — with their infuriatingly varied refresh rates of 60, 70 and more Hz — could be captured without rollover.

Perhaps acknowledging the poor performance of un baffled condenser microphones in windy conditions, a low frequency cut filter can be applied to the audio pickup.

*The matching docking unit provides a range of interfaces.*



However this is somewhat confusingly labelled on the menu as 'Wind Screen'.

Digital effects are accessed in the menu — and the range, as usual is wide: fades, wipes, a scroll effect as well as strobe, posterised, mono and sepia picture treatments.

## Nice touches

Sensibly, an accessory 'Finder Unit' is provided; in effect this eyepiece-cum-sunshade clips onto the LCD screen and prevents bright ambient daylight from washing out its display.



*There are few controls on the top, but note the cramped power/mode switch at right.*



*The LCD screen tilts up through 180 degrees, if needed, to reveal a built-in 20mm speaker.*

Also useful is a 20mm confidence speaker, tucked away beneath the lift up LCD screen.

Packing so much into such a little space calls for some ingenuity... and when it comes to switching the MV100 from a shooting unit to a replaying one, some of the external controls serve double duty. To replay a tape, you press on the manual focus button; to stop the tape requires you to tilt the same button back a touch; rewind and fast forward is achieved by twisting the focus fine tuning control.

## PC link

The MV100 can deliver and accept still frames to and from a PC, at 640 x 480 pixel resolution. To do this, a DV Capture Kit DK-1 is available. This consists of a software application Canon DV Commander, a TWAIN driver (to interface with imaging applications), an Adaptec 8940DV capture board and a Firewire link between camcorder and PC. As well, a full version of MGI Photosuite 8.05 is supplied. A Macintosh interface is not available. The DK-1 costs around \$900.

## Conclusions

Overall the Canon MV100 is a well thought out unit, with excellent picture and sound performance. But you will need to invest in a decent auxiliary microphone if you desire sound of usable clarity.

Colour was particularly well saturated, with no sign of cross colour. Audio pickup was clean, with little or no noise coming from auto focus or zoom systems.

One tick against the MV100 is its squared off, boxy shape. It's a bit hard to hold for extended periods, and even harder to stow in a coat pocket or handbag. ❖

## Canon MV100 digital camcorder

A compact, lightweight digital camcorder using the DV system. Measures 118.5 x 85.5 x 55.7mm, weighs 530 grams without batteries.

**Good points:** Excellent image quality, much smaller and lighter than Canon's earlier models. LP recording mode, timecode fitted. IEEE 1394 'Firewire' interface for PC transfer.

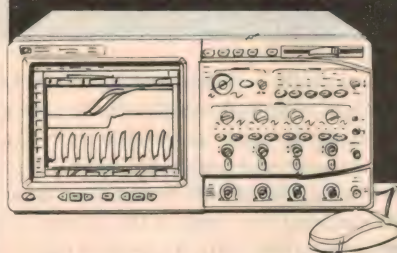
**Bad points:** Minuscule four-position main power switch; microphone axis at 90° to lens axis.

**RRP:** \$2999

**Available:** Video dealers, or contact Canon Australia, 1 Thomas Holt Drive, North Ryde 2113.



## FRUSTRATION-FREE PERFORMANCE

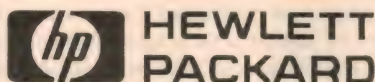


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## New Books

### Data converters

**SIMPLIFIED DESIGN OF DATA CONVERTERS**, by John D. Lenk. Published by Butterworth-Heinemann (Newnes imprint), 1997. Soft covers, 233 x 153mm, 242 pages. ISBN 0-7506-9509-9. RRP \$59.

Thanks to the ongoing expansion of digital technology, analog-to-digital and digital-to-analog conversion are now key functions in almost all electronic systems. This recent book by well-known US electronics author John Lenk seeks to provide a sound and down-to-earth introduction to A/D and D/A conversion and the practical design of converters, for working engineers and design technicians — or in fact anyone wanting to understand more about data conversion circuitry. It's another in the EDN Series for Design Engineers, published in conjunction with *EDN* magazine.

As with some of the other books by Mr Lenk in the same series, much of the device and applications information is taken from manufacturer data. However that's fine, as it helps to ensure that the book keeps its real-world emphasis and practical orientation. Mr Lenk uses specific devices as examples, and seems to have gone to considerable trouble to explain the significance of key parameters and how they're best used.

There are 10 chapters in all, starting from data conversion basics and progressing through terminology and design characteristics, the design of ADCs and DACs, inter-



facing and power supply considerations, through to examples of a low power data acquisition system and a single-chip DMM. The treatment is fairly qualitative, but with enough explanation of the device behaviour to form the basis for practical design.

On the whole it seems a well written and accessible book, which should be of value to anyone needing to design with ADCs and DACs without diving into a lot of deep theory and maths.

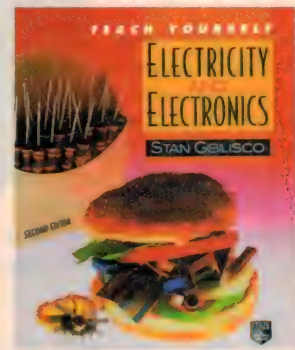
The review copy came from Butterworth-Heinemann Australia, of PO Box 251, Port Melbourne 3207. (J.R.)

### Electronics primer

**TEACH YOURSELF ELECTRICITY AND ELECTRONICS**, by Stan Gibilisco. Published by Tab Books, 1997. Soft cover, 187 x 235mm, 660 pages. ISBN 0-07-024578-9. RRP \$69.95.

This book is a second edition, and according to the author is similar to the first except for additional chapters on wireless communications, personal computers and the internet. It's a large book, with 32 chapters, and aims to cover virtually all aspects of electronics. It assumes the reader is a total novice, and starts with the absolute basics.

However don't be misled into thinking the book takes a simplistic approach to the subject. It sequences the topics in a fairly traditional way, so you learn about DC, magnetism, and



AC theory before starting anything electronic. The mathematical treatment for AC theory (reactance, phasors and so on) is based on j-notation, which is surprising in a teach-yourself book, as there are simpler ways.

While the first half of the book is basic electrical theory, the second half is pure electronics. It covers semiconductor devices, power supplies, amplifiers, oscillators, radio transmission, basic digital and computer systems. The maths level in this part is relatively simple. To this reviewer, some of the material is old fashioned (selenium rectifiers!) and could have been deleted to make way for more modern stuff. But there's still a lot of up-to-date material, with quite a bit of ground covered.

There are quite a few diagrams, circuits and tables. However the presentation, though adequate, is not quite as classy as we've come to expect. But then the book is not expensive, either.

The review copy came from McGraw-Hill, PO Box 239, Roseville 2069. (P.P.) ♦



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READER INFO NO.3

McNabb FG 4145



# Kodak's DVC323

## digital video camera

**Along with a raft of new and impressive digital still cameras, Kodak has also released a new video/still camera for use specifically with PCs — for applications like video conferencing and sending video over the web. Like the DVC300 it replaces, the DVC323 uses the Universal Serial Bus (USB) for high-speed downloading of images, plus a proprietary compression algorithm to achieve video frame rates as high as 30 frames/second.**

**by Jim Rowe**

**S**mall digital video cameras designed to hook up to your PC for video conferencing and similar applications have been around for three or four years now. However mostly they've connected to the PC via a standard RS-232C serial port, and as a result there's been a severe limit to the video frame rate they can achieve if you wanted reasonable image and colour resolution.

For example even a modest 320 x 240 pixel image in 24-bit colour involves 230.4KB of information in uncompressed form, whereas an RS-232C link running at 115kb/s can only transfer something like 14.4KB/s. So if you wanted that kind of resolution, you've been limited to one image every 16 or so seconds ('a slide show'). Conversely if you wanted a 'movie' frame rate of at least 15f/s, you had to either sacrifice image or colour resolution (or both), or use digital image compression and decompression.

It was considerations like this, plus the knowledge that PC and web users were going to want real-time video and audio in the near future, that prompted Intel, Microsoft, IBM and other industry leaders to get together, define and develop the Universal Serial Bus (USB). USB is a high-speed synchronous bus, specifically designed to allow connection of fast, data-streaming peripherals to the new generation of 'multimedia' PCs. It's essentially an external extension of the Plug and Play system, and allows 'hot swapping' connection/disconnection of cameras, scanners, outboard sound 'cards' and synthesisers,

cable modems and other devices.

The basic USB data transfer rate is 12Mb/s, or roughly 100 times faster than RS-232C. It allows up to 127 different devices to operate simultaneously on the same bus.

Most of the latest generation of multimedia PCs are fitted with a couple of USB ports, and the versions of Windows 95 since OSR 2.1 (October 1996) have included basic support for USB peripherals — although until now there haven't been too many USB peripherals available to go with them, at least in Australia. Kodak's DVC300 camera was one of the few, until very recently.

The new DVC323 builds upon its predecessor by offering even better image (and especially video image) quality, plus the

ability to operate at video frame rates up to 30f/s, for image resolutions up to 320 x 240 pixels. This is achieved by teaming up the higher speed of the USB interface with a proprietary video compression algorithm called KVID2, incorporated in an ASIC (application specific integrated circuit) which also performs digital filtering.

The new camera supports the industry standard 'CIF' (352 x 288 pixels) and QCIF (176 x 144) resolutions for video conferencing, and also the 320 x 240 and 160 x 120 pixel YUV9/12 video modes. In addition, it can operate in a 'stills' mode, delivering uncompressed 640 x 480 pixel 24-bit colour images to the computer in seconds.

The camera is based on a 640 x 480 progressive-scan CCD image sensor, coupled to



*One obvious application for the DVC323 is in videoconferencing, but it can also capture a high quality 640 x 480 still image for applications like web publishing.*





a three-element Kodak 6.2mm f/2.5 lens, with manual focusing between 127mm and infinity. Digital zooming is used to provide three software selectable fields of view: telephoto, normal or wide angle. There are also three selectable image quality levels (Good/Better/Best), corresponding to levels of video compression. Exposure and white balance are controlled automatically, while the shutter release can be either manual or under software control.

Incidentally the DVC323 is powered via the USB bus from either the PC or an intermediate hub, so unlike a standard digital video or still camera it can't be used on its own. It measures a very compact 127 x 63.5 x 51mm, and weighs only 227 grams. The attached USB cable is 3m long, allowing it to be used quite flexibly as both a handheld

device or on the supplied mini stand.

The camera comes complete with a CD-ROM containing a suite of supporting software, including the PictureWorks Live and Netcard multimedia and videoconferencing applications; Kodak's Digital Science Picture Easy 2.0 for still image capture, editing and printing; Microsoft's NetMeeting for videoconferencing, Kai's Power Goo SE for image effects; and various video and TWAIN drivers for Windows 95, 98 and NT5. There's also OCX 32-bit

### Kodak DVC323 digital video/still camera

A compact, low cost PC-tethered digital camera delivering up to 320 x 240 video at 30 frames/sec, or 640 x 480 pixel 24-bit still images.

**Good Points:** High quality real-time digital video, fast downloading of still images due to USB interface, proprietary compression technology.

**Bad Points:** Only compatible with MMX Pentium machines fitted with USB and Windows 95/98.

**RRP:** Around \$349.

**Available:** Kodak dealers, or contact Kodak Digital and Applied Imaging on 1800 674 831.

control and documentation, to allow Visual Basic and C++ programmers to create custom applications, and trial and demo versions of various packages including White Pine's Enhanced CU-SeeMe.

By the way as Windows NT4 doesn't support USB or Plug and Play, the DVC323 isn't NT4 compatible. This also applies to Windows 3.11 and earlier, and also Macintosh. Right at the moment, therefore, the DVC323 is really only compatible with Win 95, Win 98 and NT5 when it's released.

The hardware requirements are basically an MMX-Pentium based system fitted with USB ports, a VGA display or better, 16MB of RAM, 13MB of hard disk space and a CD-ROM drive.

### Trial a no-go

Although Kodak very kindly sent us a DVC323 on loan for review, we weren't actually able to try it out because the only machine we have access to that's fitted with USB ports (my own HP Vectra VL6 with a 266MHz Pentium II) is running Windows NT4, which doesn't actually support USB. Disappointing, but there you are.

For those with a compatible system, though, the DVC323 should be of considerable interest — especially if you want to use your new multimedia system for videoconferencing. ♦

## Radio Theory Handbook

3rd edition

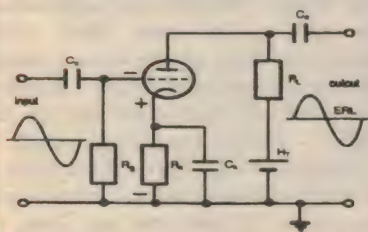
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READER INFO No. 4



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READER INFO No. 5



## Assembling your own

# \$100 Personal Computer - 2

Here's the 'second half' of reader Robert Gott's description of how to assemble your own DOS-based PC 'on the cheap', using second-hand parts from various sources. Here he explains about low-cost printers, the kind of hard disk drive to go for, operating systems, making a 'boot floppy', software and getting it all going.

by D. Robert Gott

**W**e left off last month hopefully with a 386 or 486 IBM-compatible computer, working from one FDD. Did you get that far? Don't worry if you didn't, as it is more important to get into computing than to rush matters.

Also a reminder: try not to exceed the \$100 total budget. You will no doubt see in adverts things like '386DX33, 8MB RAM, VGA (colour) monitor, Win 3.1 etc., \$185'. It may look tempting, but there is much more to go wrong, and Windows-based software realistically needs a serial port and mouse — not in the budget at this stage.

### The printer

Just as we needed a monitor, keyboard, and FDD (floppy disk drive) to do something with our new toy, we can defer getting a HDD (hard disk drive) at this stage, in preference to a printer. I managed for a year with two 360KB FDD's on my original XT computer. Sure, it was slow to print, but I did a lot of word processing on that machine — and more to the point, learnt about computers.

A nine-pin dot matrix printer is slow, but cheap and reliable. My unit is the ubiquitous Epson LX400, but there are plenty of other brands. Try to see one that's working before you part with cash. Better still, people who buy new systems often have a perfectly working spare as back up. See if any of your friends will part with one for \$20, including Centronics cable and manual.

Also make sure that the tractor feed and accessories are included. Who knows, they may throw in enough continuous feed paper to last you several months. Likewise, don't discard the ink ribbon if it prints, albeit somewhat less than jet black. A month's use before shelling out \$7 for a supermarket replacement is fine.

See if you can get someone to show you how to set up the printer first time — the seller perhaps, if they are local — as they can be tricky beasts.

Fig.3:  
The minimum configuration for a HDD

#### The autoexec.bat file:

```
echo off
prompt $p$g
path = c:\dos
```

#### The config.sys file:

```
files = 20
buffers = 20
```

For the brave, connect your special parallel Centronics cable (named that after the original manufacturer of one of the plugs — the one at the printer end) from the printer to the 25-pin socket on your HGA (Hercules graphics adaptor) card. Then load the paper, plug in the mains lead and switch on. Boot

up your computer. Soon after, you should hear the familiar 'duga - dug - dug' noise from the printer, as the computer 'initialises it' (for want of a better word).

Without any special printer software (called a 'driver'), DOS can perform what's known as a screen dump. Get a screenful of text showing on the monitor, then press and hold down the [Shift] key whilst pressing down the [Print Screen] key. Your printer should now sound like a bacon slicer, with the print head chuffing back and forth — and wonder of wonders, there is all your text. Hopefully it will stop itself too. Should it not, don't panic; just turn off the mains switch on the printer (you cannot do any harm), then seek help.

Of course, because this type of printer forms letters (text) by a combination of nine dots, its quality is modest in 'draft' mode — the fastest printing. But in NLQ (near letter quality) mode, which gives slower printing — up to two or three minutes per page — a very reasonable personal letter can be produced.

I cannot tell you just how excited I was with my first Epson LX400. I was like a young fella riding a bike for the first time. Hope you feel the same, but to be honest, you will need patience when you come to word processing, as printing can be tricky.

### The hard drive

I've left the hard disk drive or 'HDD' until last in our shopping list, as it needs considerable thought. For DOS based applications, you rarely need more than 45MB (megabytes). Those used to loading modern 200MB games may scoff at this, but truly, I never filled my first HDD on my 286 machine — because I mainly do writing.

In last month's *EA* I advised you to get an IDE 45MB HDD too, and that's still my recommendation. I think this was about the minimum capacity (MB) made in IDE drives, which have the electronics on board rather than on a computer card. More important, they are already low level formatted. Later on you will understand!

As I mentioned before, if possible try to



Fig.4: A closer view of the author's own DOS-based 386 computer system, which was used to write these articles. It's now complete with a 45MB hard disk drive (HDD).



buy a HDD with installed legal software. A good MS-DOS is version 5.0 or 6.20 — preferably the former, as this has a feature called DOSSHELL which supports a mouse (something you may afford later, but not essential now).

It is vitally important that you obtain the HDD details from the vendor: make, model number, cylinders, heads, write pre-comp, sectors per track, park cylinder and capacity in MB. Sorry, this is the really hard part, but please do not buy without this information.

HDDs do not like jolts, knocks or drops — so don't buy one that has been dropped, and don't mistreat one you've bought.

Modern ones 'self park' — that is, when switched off, the reading heads rest over an area of platter that is not used for storing data. Older types, including mine, need to be parked manually. This is no big deal; you simply type 'hddpark' and a small parking program of that name does the job and tells you when it's OK to switch off.

It's probably a good idea to ask the seller if it needs manual parking, and do so before taking it home.

## Software included?

When you're buying a HDD, ask what software is installed, or included. Take everything offered. If you are totally new to computing, mention that fact. You will be surprised how generous people are towards beginners, as many have been in the same lowly state. I was!

You will need help again with the installation. Even if you get the cables and mounting correct, there is a set-up procedure to be followed the next time you boot the computer. Ask your friend to explain it slowly and take notes. In brief, immediately after boot-up, press [Esc] which takes you into the BIOS SETUP programme. (Sometimes it's another key, or a combination of keys.) It is here that you change the date, time, FDDs and HDD details. After this has been done you 'exit and save'. The computer should then boot correctly to the C:\> prompt.

## A 'boot disk'

Right now, take a new 1.44MB floppy — not write protected — and insert it in the FDD. Then type in the following command, very carefully:

```
format a:/s
```

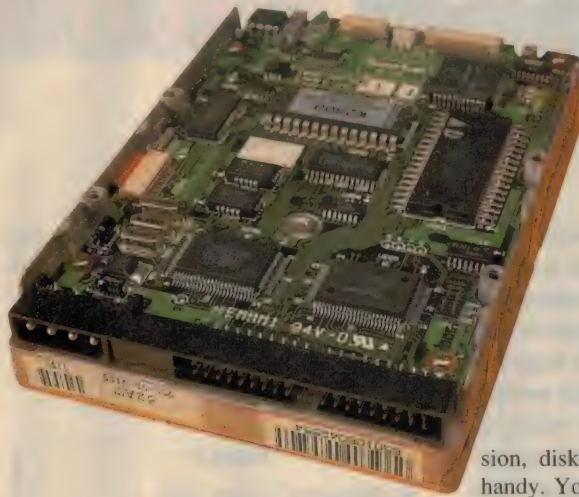
Notice that there's a space between 'format' and 'a:/s', and the s has a *forward* slash ahead of it, not a backward one (backslash). Also make very sure you put an 'a' before the colon — NEVER, NEVER type 'format c:', otherwise it will wipe your HDD. Sob, sob and much heartbreak!

If this does not work, when you press the [Enter] key, it will probably be because the format utility is in a subdirectory — usually the DOS one. In this case change directory

first, by typing this command:

```
cd dos
```

When you press the [Enter] key after this, the prompt should change from 'C:\>' to 'c:\dos>'. Then you should be able to type in 'format a:/s' again and it will work.



*Fig.5: Two views of a small IDE type HDD, of the type suggested by the author. There are only two connectors: a four-pin connector for DC power, and the 40-pin (2 x 20) connector for the IDE ribbon cable.*



This will prepare your floppy for storage, and also copy two hidden files, **io.sys** and **msdos.sys** to it. You'll now have a boot floppy in case your HDD crashes — perish the thought!

Remove the floppy, write protect it, replace it and press the RESET button on your computer. The computer should boot up to display 'a:\>', whence you can type in 'c:' to change back to the 'c:\> prompt and use the HDD again.

Phew — this takes a lot of text to explain! Remove and keep this boot disk in a safe place.

## Directories & files

By now I hope you have read a simple

book on DOS, so you probably know what a directories and files listing looks like. You will note that there are two files in the root directory of c:\>, called **autoexec.bat** and **config.sys**. I suggest your ever-helpful computer friend shows you how to configure these using the 'copy' and 'con' commands, **EDLIN** (in MS-DOS 3.30) or **EDIT** (in MS-DOS 5.0 and later).

For a simple configuration see Fig.3, which sets up the prompt to show the directory that you are in, allows access to DOS programmes from the c:\> prompt, and also sets the required buffers and files.

Type **chkdsk** (by now I'm sure you know to press [Enter] — sometimes called [Return] — at the end), and a very handy DOS programme analyses your HDD and shows your DOS version, disk space, files and memory. Very handy. You are always returned to the relevant command line prompt, in this case c:\>.

## Applications software

Before we finish, a word or two about software is in order. Obviously it is too vast a subject to cover in a two-part series, but I can tell you what I found helpful to get me going.

A basic word processor that will run and print from one (yes, just one) FDD is Galaxy Lite or Glite as it is known, which incorporates a dictionary and spell checker. I'm sure a legal copy could be had for \$2 to get you going. Further down the track, Microsoft WORKS 3.0 for DOS is an excellent word processor, spreadsheet, database, and communications package — I used it to write these articles. The word count feature is invaluable.

Incorporated in MS-DOS 3.30 and 5.0 are GWBasic and QBasic, for those inclined to dabble in programming.

There are thousands of DOS games, scientific and technical software on floppy disk, available second-hand from swop meets, markets etc. There is so much to learn...

## YOUR system

I hope that I have encouraged you to have a go. Have you lost your fear of computers? By now you may not be so-called computer literate per Pentium and Win95, but you are on your way.

Fig.4 shows my complete \$100 system. How does yours look? Maybe you did better! The important thing is that it works reliably and you are now enjoying computing. The other features can be added as you can afford them.

I hope I haven't made too many mistakes in telling you how to get going. I'm not a computer expert, just someone like you maybe — willing to learn, in this case at age 62. Good luck and happy computing! ♦





## Reading ECM diagnostic codes

**The electronic control module in most modern vehicles can be persuaded to produce diagnostic codes, which can give you some useful clues as to what may be going wrong. While these codes are ideally best 'read' using a high-tech code reader, with many models you can get most of the basic information using a low cost build-it-yourself LED tester and a shorting lead...**

**T**est equipment for the automotive industry can sometimes prove to be quite expensive. What with rising costs in the automotive repair industry and leaps forward in the technology used on vehicles, the automotive workshop is starting to resemble an operating theatre, with the patient surrounded by machines that go ping!

Well, it may not be *quite* as drastic as that, yet most workshops have a number of computers crunching bits and bytes to help get the best performance and compliance for the modern horseless carriage.

The list starts with a tunescope — quite a large beast. Some are PC driven, and some have dedicated controllers. Either way they can be connected to an interface box that connects to the engine, to show the technician what is happening during the 'suck-squeeze-bang-and-blow'. Normally the main unit can also interface to a micro controlled gas analyzer, which is used to determine if any problems exist with emissions.

The tunescope can perform a number of tricky things, such as providing a general purpose two-channel oscilloscope for measuring all sorts of signals.

Another tool available to the technician is the Electrajet (discussed a number of issues ago). This provides the technician with heaps of information about various engine management systems. The external interface sucks all the data on the pins into the PC and gives an indication of any problems by comparison with 'normal' voltages and waveforms.

A chassis dyno (dynamometer) might be

nice for tuning the odd gas job, and also running cars with faults that are not apparent with the vehicle stationary. A lot more cars these days are four-wheel drive, so it may be necessary to get a four-wheel dyno (ouch — a great tool for tuning 4WD and rally cars, but they are not quite common place — Yet!).

CODE	FAULT
No Sequence	Faulty ECM
One Flash	Coolant Temp Sensor
Two Flashes	Defective MAP Sen/TPS
Three Flashes	Defective MAP Sen/TPS
No Flashes	No Fault

**Fig.1: The code summary for a VK Commodore (EST).**

CODE	FAULT
11	Pass
21	Coolant Temp sensor
22	MAP Sensor
58	TPS
68	TPS

**Fig.2: The summary for an XE Falcon (EST).**

The dyno will have a PC attached to it and there will also be another PC in the office, taking care of the numbers game (\$in vs \$out).

I'm sure that I have mentioned before that in a humble EB Falcon there are up to five ECM's controlling various functions. So one way and another, the average workshop tends to have quite a few computers crunching away — some more visible than others.

It may come as no surprise, then, when I tell you that electronics technology has fully (and successfully I might add) invaded the automotive arena. Which brings me to the subject to be covered this month: how you can get diagnostic codes from various vehicles without purchasing a \$3000 code reader.

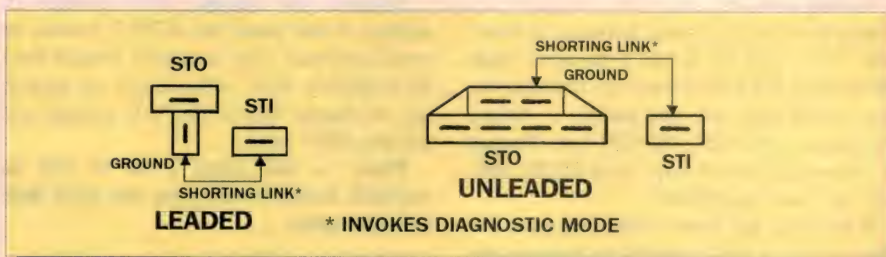
## Readers fantastic

First up, I must say that the code readers are fantastic tools. I use a SPX Monitor 4000 and it works extremely well. It has the necessary interface harnesses, so that no connection problems can occur. It also has a comprehensive manual which describes where to find the connectors on the vehicle...

Yes, you *would* have thought by now that the automotive industry could have decided on a common location and format for the interface connections, and the protocol could be standardized. But it's a case of "Not yet — soon", as they say in hushed tones. That doesn't help with the millions of cars that are already manufactured, of course.

Anyway the object of it all is to be able to get codes out of various vehicles, cheaply. And even though code readers are the only way to go on late model stuff, the early models can still be made to 'spill their guts' and inform the technician of any real or potential problems...

By the way, some technicians believe in using codes and some steer well clear of them. I guess that's because they have sometimes been misleading. For instance on a VL Commodore, getting the codes out is quite simple. There is a diagnostic screw on the side of the ECM. When code mode is entered, the codes come out straight away via a flashing green and red LED. But with



**Fig.3: Diagnostic connector pinouts for the XF and EA Falcons. In each case the shorting link invokes the ECM's diagnostic mode.**



CODE	FAULT	CODE	FAULT	CODE	FAULT
10	Separator Code	41	O2 Sensor - Low	63	TPS Voltage -Low
11	System Pass	42	O2 Sensor - High	64	ACT Voltage -Low
12	High Idle Fail	51	ECT Voltage Too High	67	A/C NDS Switch Fault
13	CFI Idle RPM	52	Power Steering	68	Idle Tracking Switch
15	Bad KAM/ROM	53	TPS Voltage Too High	78	Key Power
16	RPM Low - Fuel Test	54	ACT Voltage Too High	85	Purge Valve
21	ECT Out Of Range	55	CFI Internal +Ve Low	87	Fuel Pump Circuit
23	TPS Out Of Range	58	Idle Tracking Switch	99	Idle Speed Correction
24	ACT Out Of Range	61	ECT Voltage Too Low		

Fig.4: The more comprehensive code listing for the EB Falcon.

early VL's a common complaint was that "The TPS code never seems to go away". Here the TPS (throttle position sensor) had probably not been operated since the last drive; as a result the ECM has not seen it move, so until you put your foot on the throttle the code remains logged...

The AirCon, Neutral/Drive switch and vehicle speed sensors all operate in a similar manner to the TPS. This presented a couple of easy fixes in the early days, because all you had to do to fix those particular codes was to drive the car! But now just about everybody knows this about VLs, it is not such a problem.

## Low cost tools

This is a little against my principles, going low tech. That's because I would normally advise that if you haven't got the right test equipment or the information, don't take on the job. But this information is more for the enthusiasts amongst us, who wish to dabble in the black art of automotive electronics only on a casual or temporary/emergency basis.

The tools we need for the experiments will be an LED tester (a LED with a series 1kΩ resistor) and a piece of wire (put a fuse in it just in case). Once you have these tools, we can decode a few vehicles.

## Early EST models

The EST VK Commodore and XE Falcon were the first Australian-built vehicles to have diagnostic codes available, and they are both very easy to get codes from. The VK has a connector under the bonnet taped to the harness at the rear of the engine. It has to be earthed, with the engine running, then the codes will flash out on the dash via the EST lamp.

Fig.1 lists the codes, but it should be noted that the system waits 6 - 8 minutes during warmup, to ensure that the coolant temp sensor changes. So you may have to wait a while. The unit does not remember codes, so once the key is off the codes are lost. (Not very good when you are chasing an intermittent fault!)

The XE EST is much the same, but you will need the LED test light or a multimeter to access the codes. Here the diagnostic connector is located under the bonnet near the brake master cylinder. The white/red wire (single connector) is connected to the black

the brown/red wire in the gray connector. The codes for the XF EST are listed in Fig.2.

The Ford range of vehicles for a long time (approx. 1983 - '92) employed the same type of diagnostic plug, which means that codes are accessed in much the same

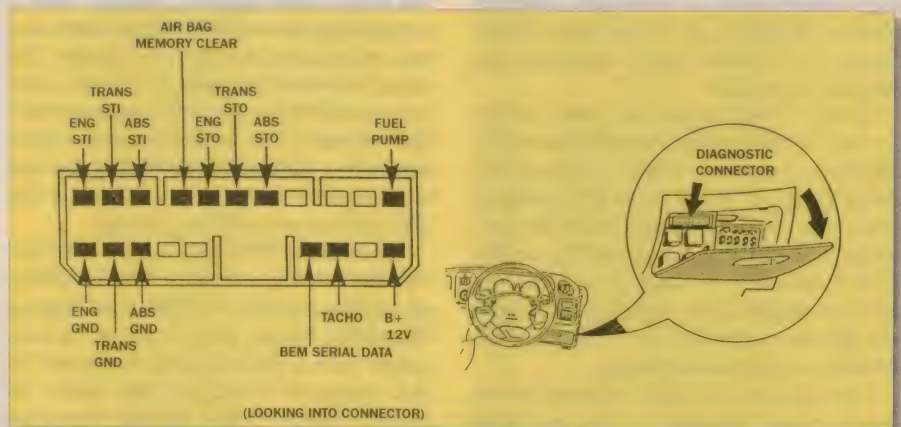


Fig.5: The pinouts for an EB Falcon (late model) diagnostic connector, and also where it's located.

wire in the large gray connector and the LED tester is connected between the battery and

way for later model vehicles.

XF EFI *leaded* vehicles have the diagnostic connector on the passenger side and XF EFI *unleaded* vehicles have the same gray plug as the EST version, near the brake master cylinder (see Fig.3). The EA and EB series have the same plug as the XF but there are more codes available (see Fig.4). The late series EB has a connector inside the cabin just under the steering column, which allows access to a number of diagnostic modes for individual ECM's (EFI and transmission ECMs, etc.). The V8 has extra modes — it has full sequential injection control and there are variations on the codes available. But the connections to the ECM and the system codes are very similar from the XF through to the ED.

The later model diagnostic connector is shown in Fig.5. When decoding on the Ford system, if you need to re-read the codes

CODE	FAULT
11	Crank Angle sensor
12	Air Flow Meter
13	Coolant Temp Sensor
14	Vehicle Speed Sensor
21	Ignition Signal
23	Throttle Position Switch
24	Neutral/Park Switch
31	Air Conditioning Request
32	Started Motor Signal
44	Pass Code

Fig.6: The code summary for a VL Commodore.



# Auto Electronics

ensure that you leave the ignition off for at least 15 seconds between code reads. To erase the codes, disconnect the shorting link while the LED tester is flashing (during reading).

GMH went a different way when they released the VL (remember the EFI VK did not have diagnostic capabilities). The VL used a modified Nissan Skyline engine, transmission and electronic control system, which proved to be very successful combination. As discussed previously to get codes from a VL, the diagnostic screw on the ECM must be turned fully clockwise; the LEDs then flash the codes. The codes for the VL are listed in Fig.6.

The next series, the VN, had a radical change. GMH introduced the 3.8 litre V6 engine with a Delco control system. This system was a big leap forward in technology, because it was the introduction of data-link communications for diagnostics on Australian vehicles, and it incorporated an interesting hardware application. The engineers implemented a removable EPROM called a MEMCAL, so the unit can be calibrated for different engine capacities and number of cylinders.

On the VN-VP series the codes can be accessed by linking the two end pins on the diagnostic connector, which is located just above the ECM. Where is the ECM located, I hear you ask? It is located under the passenger side kick panel. Incidentally, the VL ECM is located in the same place. Once you earth the diagnostic pin (see Fig.7), the codes will appear on the dash via a flashing MIL (Malfunction Indication Lamp).

Code 12 (one long flash followed by two shorts) means 'all clear' — i.e., no faults picked up by the ECM. The ECM will bring the MIL light up itself for some faults, to alert the driver of a problem. The summary of codes is provided in Fig.8.

## Decoder advantage

I mentioned earlier about using a decoder to access codes from the ECM. Well, there is a

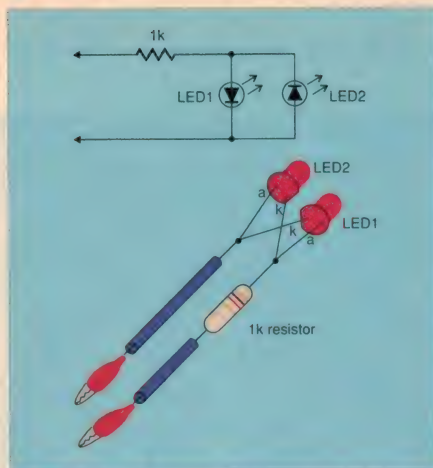


Fig.9: How to make up a simple LED tester...

distinct advantage to using one, and that is the fact that it can provide the operator with 'live' information about what is happening regarding input sensors and injection times etc. This may make it easier to diagnose faults and also investigate any mixture-related fault, because there is a function available on the Delco system which allows adaptive learning. There is a short-term and long-term adaptive learn feature, which can be accessed by a decoder. The value for normal operation is 128, this number is modified (up or down) to represent mixture variations. You cannot access this information by a LED, or via the MIL; it can only be accessed by a decoder or a PC with a suitable interface and software package.

The Monitor 4000 that I use has two basic software cartridges that have heaps of different models available — GMH, Ford, Toyota, Mitsubishi, Suzuki, etc., etc. All of the dealerships have a dedicated data-link tester for their particular brand and this makes the monitor 4000 or CODA (another very good brand of data-link reader) great value because it covers a wide range of vehicles.

There has been some reluctance by automotive workshops to purchase electronic test equipment. That's because one, it has to pay for itself; two, there are training and technical support issues; and three, many years ago expensive tunescopes were supposed to be the answer

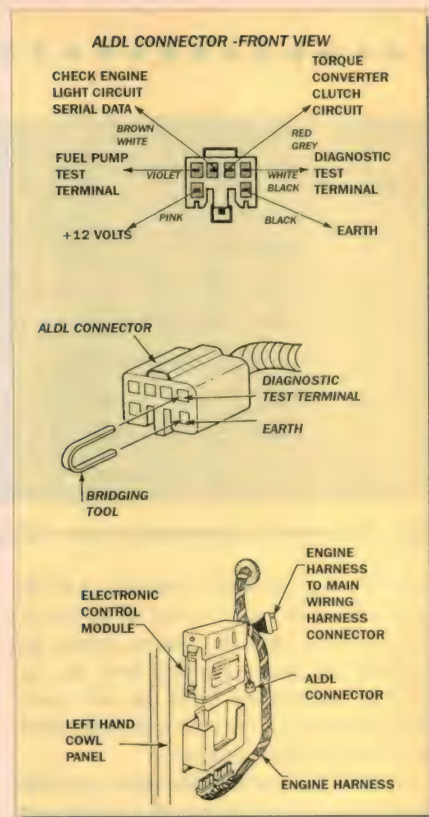


Fig.7: Pinout, location and diagnostic link details for the VN Commodore.

to all modern automotive problems, and they weren't. I should add that there's no doubt modern tunescopes are very powerful, and some even include a data-link read function.

So despite a history of suspicion, most workshops are now prepared to invest hard-earned dollars into test equipment — because of the upgrade in sophistication, flexibility and technical information available.

## Make your own

But enough of that, and back to our LED tester. It is probably better you use two LEDs, connected back to back so that when you are testing for codes, whichever way you get the orientation at least one of the LED's will illuminate. Ready for the high Tech bit?

Solder the LEDs A to K and K to A. Then solder an insulated wire on to one lead and a resistor (anything between 680Ω and 1000Ω should suffice) to the other lead, with a second insulated wire to the resistor's other end. Then fit an insulated crocodile clip to the far ends of the two wires, and bingo! You now have a very useful hand-made LED tester (Fig.9).

Cut another length of insulated wire for use in forcing the ECM into diagnostic mode, with a crocodile clip at each end. (Put a fuse in it as well, as mentioned before — just in case!)

Now you should be able to go forth and decode. If the details for your make and model don't appear this month, I'll cover more variations as space permits. ♦

CODE	FAULT	CODE	FAULT
12	System Pass	33	MAP Voltage >High
13	O2 Sensor Open Circuit	34	MAP Voltage <Low
14	CTS Voltage <Low	41	Crank Ref Signal Fault
15	CTS Voltage >High	42	EST Spark Fault
21	TPS Voltage <Low	43	Knock Sensor
22	TPS Voltage >High	44	Lean Exhaust
23	ATS Voltage > High	45	Rich Exhaust
24	VSS no signal	51	Memcal
25	ATS Voltage <Low	52	A to D Error

Fig.8: The code summary for a VN Commodore.



# MicroGram Computers

## Hard Drive Recovery Card



FORMAT, FDISK, VIRUS.....OOPS! Recover data from your hard drive after FDISK,

FORMAT or DELETE commands or even after virus attacks. Supports DOS, Windows 3.x, Windows 95, OS/2 and Windows NT.

Cat. No. 3374 Hard Drive Recovery Card \$149

## CPU Voltage Checker

Avoid CPU burnout! Make sure you have the motherboard jumpers set correctly. This unit checks and displays the voltage on the CPU socket before the CPU is inserted. Ideal for those who upgrade systems, install motherboards, sell processors, build systems, service and repair or for educators and schools.



Cat. No. 3365 CPU Voltage Checker \$99

## Removable Hard Drive Kits

Consists of a 5.25" mounting rack & a removable tray for 3.5" hard drives. A keylock prevents inadvertent or unauthorised removal.



Applications include:

- securing confidential data in a safe overnight
- providing off-site backups
- easy interchange of OS (eg DOS to Windows NT) by simply replacing drives

Cat. No. 6049	IDE Kit	\$111
Cat. No. 6048	SCSI Kit	\$121
Cat. No. 6200 / 6224	IDE Tray / Frame Only	\$70
Cat. No. 6201 / 6225	SCSI Tray / Frame Only	\$76
Cat. No. 6327	SCSI Fast Wide	\$169

## Hi- Scan Bar Code Readers



High resolution CCD bar-code scanners which feature multi-interface communication with RS-232C, Wand & Keyboard Emulation in one unit.

Simply release the RJ-45 jack to change cables! Offering optical performance with a minimum resolution of 0.125 mm & maximum reading distance of 20 mm it is possible to read high-density, laminated & acrylic-covered bar codes.

Cat. No. 8458 Hi Scan Bar Code Reader KB Wedge \$699  
Also available, Long Range CCD bar code scanners which offer variable width and depth of field.

Cat. No. 8489 CCD Bar Code Scanner Long Range KB \$469  
As well as our standard range.

Cat. No. 8196 CCD Bar Code Scanner KB Wedge 80mm \$359

## Multi-PC Controller 8 Way 2 Control

A controller with two control keyboards, monitors, mice and sound equipment which allow two operators simultaneous access to eight computers (not the same computer). Auto scan or manual selection (key strokes or switch) of the PC's is provided. This desktop model is designed for multi file server installations and the controllers can be daisy chained to provide two consoles with control over 64 computers. It can be located on the desktop or mounted in a 19" rack.

Cat. No. 11637	Multi-PC Controller 8 way 2 Control	\$1999
Cat. No. 11636	Multi-PC Controller 4 Way 2 Control	\$899

## Internal UPS & Power Supply



It's not just a UPS but also a 300W power supply. The UPS is actually built into a standard size power supply and the

batteries and front panel occupy a 5.25in drive bay. The UPS is rated at 500VA. Apart from power failure, the UPS also protects against over voltage, under voltage, overload & DC short circuit. The unit is available in two sizes - PS/2 or ATX. Optional software provides for automatic shutdown.

Cat. No. 8498	UPS / PS (PS/2) Int 500VA/300W	\$429
Cat. No. 8588	UPS / PS (ATX) Int 500VA/300W	\$399
Cat. No. 8499	UPS / PS Internal RUPS S'ware	\$99

## Year 2000 BIOS Card

Even Pentium motherboards are not immune to the Year 2000 bug! The Year 2000 BIOS Card solves the problem of progression from 1999 to 2000 as well as 21st century leap years. It is an 8-bit card which provides year 2000 support for motherboards with a BIOS which only stores the year with two digits. i.e. 97 instead of 1997.

Cat. No. 3359 Year 2000 BIOS Card \$129



## Bi-directional & ECP/EPP Printer Cards



Bi-directional parallel ports with an 83 byte FIFO buffer, configurable from LPT1 to LPT6 and set on interrupts 3 to 15. Achieve data transfer rates up to 1Mb/sec with ECP/EPP.

Both ports provide 7 selectable I/O port addresses and 10 selectable IRQ's. The single port ECP/EPP card provides 7 DMA channels while the dual port card provides two DMA channels.

Cat. No. 2314	Bi-directional 1 Port	\$45
Cat. No. 2315	Bi-directional 2 Port	\$61
Cat. No. 2316	Bi-directional 3 Port	\$97
Cat. No. 2235	ECP/EPP 1 Port	\$79
Cat. No. 2236	ECP/EPP 2 Port	\$94

## TV & Capture PCI Card



The TV tuner displays real-time video images on your computer screen. It includes its own television tuner to accept television signals via cable or broadcast TV. It also

can play audio/video from external video players like VCRs and camcorders.

Cat. No. 3357 TV & Capture PCI Card \$369

## Multi-Network Cable Tester Pro

This Plug and Play advanced design cable tester will test both 10Base-T (Category 3-5) and 10Base-2 (Coax) cable within seconds. It runs all tests automatically and LED's indicate the results. It will test cable continuity, open pairs, shorted pairs, crossed pairs or reversed pairs.



Cat. No. 11515 Multi-Network Cable Tester Pro \$259

## External Case for CD-ROM or HD



No more overheating! A cooling fan and ventilated front panel allow free air flow. A versatile external case for two 3.5" or 5.25" SCSI half height hard disk drives or CD ROM drives, tape drives etc. Featuring a built-in 80W power supply. Models for 4 & 9 drives also available.

Cat. No. 6384 Ext Case 2 x HDD or CD ROM SCSI \$199

## Surge Suppressors

Protect your equipment & networks against power fluctuations, spikes, cross talk, induced transients & close proximity lightning strikes.

Cat. No. 8386	RS232	DB25	\$79
Cat. No. 8387	RS422	DB15	\$59

Complete 10BaseT protection.

Cat. No. 8388 10BaseT RJ45 1 Port \$59

## Compact Multimedia FM Radio Receiver

A high quality FM stereo radio that simply plugs into a serial port while a stereo RCA cable connects to a sound card. An antenna also plugs into the unit. Fully clickable controls enable you to scan the frequencies from 87.5 to 108MHz, tune a particular station and name it as one of ten preset stations.



Cat. No. 3304 Wizard Radio FM Radio Receiver \$79

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# Computer Clinic

## Problems with Arachne, and tips on computer languages

### Tangling with Arachne

In his column in the March issue, Tom Moffat mentioned 'Arachne', a web browser that runs from DOS — not Windows. I was very interested in this and so I promptly downloaded it for a try out. Unfortunately, I have had no luck getting it to work. After much tinkering, I am at the stage where the program seems to successfully dial and connect to my ISP, but the connection immediately drops out. I have a reasonably good working knowledge of computers/DOS/Windows, however the internet is nearly all a mystery to me and so I am at an impasse. Can you help? I also have MS Internet Explorer on my computer (running under Windows 3.1) which is my usual browser. Could this be clashing in some way with the Arachne program? (Paul van Pinxteren, by email)

Before you start, I presume that you've got the connection to your ISP working up to the point where it goes into PPP mode. That is to say, it starts spouting strange-looking gibberish with lots of curly brackets. If not, this is what to do:

On Arachne's Setup PPP screen, ensure that the 'Show Terminal Window' box is checked, and that the 'Autologin' box is cleared. You can setup auto login later, but this way is easier to debug. Start the dialling process, and go through your normal login procedure. (On most ISPs, just type your username at the first prompt, and your pass-

word at the next. Some ISPs may also require that you type 'ppp' at the next prompt.) At this point, hit Alt-P, and the browser should connect and download the Arachne home page. If it doesn't, read on...

I've spent a good deal of time researching this one, and the two things that seem to cause this on most systems are internal modems and incorrectly setup password settings. Arachne seems to have problems with a lot of internal modems, as they quite often have non-standard IRQ settings or base addresses. My internal modem, for example, runs on COM3, and uses IRQ3, instead of the more usual IRQ4. The really strange part is that although the dialler can handle this with no problems, the PPP driver that Arachne uses isn't that clever and refuses to believe that there's a modem connected at all.

There is a fix for this available at <http://www.comminfo.com> in the form of the CTSSPU package. This is a set of shareware utilities that can correctly detect, diagnose and setup all the serial ports on your system. If you include it in your AUTOEXEC.BAT, there's a good chance that the PPP driver will detect your modem correctly.

The other thing that can cause problems is the password saving feature. I didn't bother including my username and password in the setup configuration, because I was doing a manual login as described above; but Arachne can't seem to cope without a password in the config file, and passes invalid arguments to the PPP driver. Make sure that you enter your username and password

wherever it asks, and ensure that the 'Save password' box is checked.

If you do all the above, and make burnt offerings to the appropriate gods, you stand about a 50-50 chance of having the whole thing work. Remember that Arachne is still in beta, and on the few occasions that I did manage to connect, the thing crashed about two minutes later anyway. But hey, it's free, and if you can get it to work reliably, you have a perfectly good browser that's fun, free and doesn't make Microsoft any richer.

If you do still have problems, you can join the Arachne mailing list, where you can talk to hundreds of experienced Arachne users who should be able to help. To join, send email to [listserv@main.naf.cz](mailto:listserv@main.naf.cz) consisting of the words 'subscribe arachne-digest' (without quotes). Good luck!

### Windows programming

**I have built your 24 I/O line project, and I want to write some Win 95 software for it. I've already done some programming in QBASIC and C, but I haven't had any experience with Windows programming. Could tell me what language would be best for a beginner to start off with?** (David Healy, by email)

Well now, that is a thorny one. There are a number of Windows software development packages (to use the official Microsoftese) out there, so I'll go through a few of the major ones for you.

#### Microsoft Visual C++

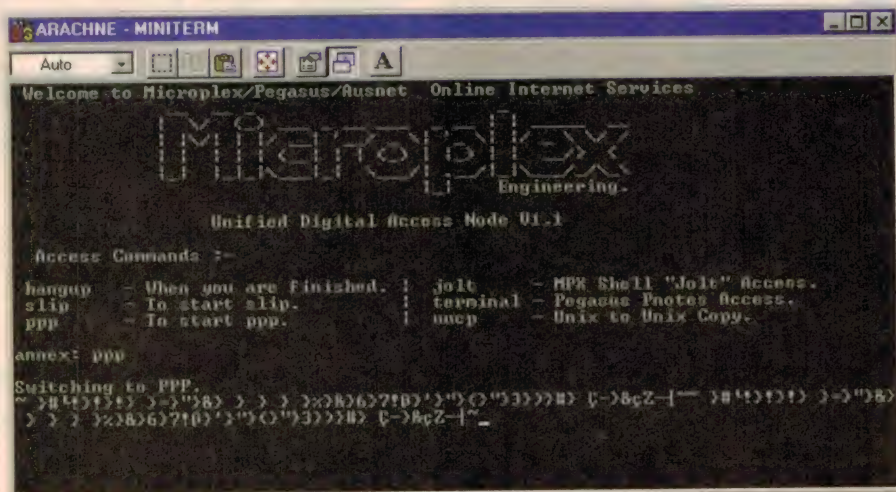
*The good points:* You can do absolutely anything with it. There are no limits. A goodly percentage of large commercial applications are created with it, and the whole package is extremely professional.

*The bad points:* It's a real cow to use. Unless you have a degree in advanced quantum physics, creating even the simplest program is almost impossible. The 'Hello World!' example in the manual takes up 187 pages! I kid you not. It's also horribly expensive, at \$739.

I recommend that you don't start out with this one.

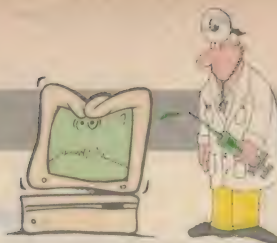
#### Microsoft Visual Basic

*The good points:* It's extremely widely used, so there's a huge amount of support for it. The language itself is BASIC, so it shouldn't be too hard to get into. It's also highly connectable with any other software that has a Visual Basic interface.



*It may look like line noise, but the gibberish at the bottom actually means that your dialler has done its job, and it's time for the PPP driver to take over. If it can, that is...*





## Things NOT to do...

If you've been following the news lately, you'll probably have heard about the famous FOOF bug now plaguing Intel. It turns out that if certain Pentiums run a program containing the bytes FO OF C7 C8, they will fall over and die, crashing the system. Well, this may be all very worrying for NT users, but if, like me, you've had any experience with DOS, you'll know that there are much simpler and more gratifying ways to achieve the same result. Let's see how many different crashes we can come up with...

The simplest and easiest way to knock over a DOS system from software is to run COLDBOOT.COM or WARMBOOT.COM, available from the EA BBS or web site. Apart from the obvious frustration release, these little programs are actually quite useful for scheduled shutdowns.

If you're not worried about having the computer start up again, it gets even easier. Want a bug named after yourself? Easy! Enter a text editor, type in your name, and save as DIE!.COM. Unless you're running Windows 95 or NT, or some other fancy crash-resistant OS (i.e., you are running straight DOS 6.22 or lower), typing DIE! will very likely send your computer into a screaming heap, all caused by your very own name.

Another nasty situation can be caused by typing CTTY NUL. The CTTY command changes DOS' default input and output source to be moved to the device stipulated. This is usually used for benign purposes, such as redirecting command output to a printer. NUL is the null device, the digital equivalent of a black hole, usually used to soak up unwanted command output. Combining the two results in an unparalleled display of navel gazing, interruptible only by rebooting.

And finally, while we are on the subject of devices, there's a nice entry in the device table called CLOCK\$, designed to allow esoteric system functions to access the Real Time Clock. If you send data there, it can overflow and do things it really shouldn't. If you save a file as CLOCK\$, the results can be... interesting, to say the least.

Of course, the above information is provided for educational purposes only. If you are actually foolhardy enough to do any of these things, that's your problem. You will lose any unsaved data, and there is a remote possibility that you could even mangle files on your hard drive. If you deliberately crash someone else's computer, you could get into very hot water indeed. Just don't sue me if anything nasty happens.

*The bad points:* It's a mess. You can't see all your code at once, and there are windows everywhere, just sort of scattered around your desktop. The language itself is BASIC, which kills about 12 brain cells for every line of code you write. All VB apps tend to have the same rather amateurish look to them, you can spot them a mile off. What's more, they need various DLLs to be present, which makes distribution a bit of a pain. In fact, if you get the Standard edition, you are not allowed to distribute the necessary DLLs with your finished program; for that privilege, you have to get the Professional edition, again at \$739.

You could do worse, but you could do better. VB is one of the most popular small-app packages out there — but quite frankly, I don't like it, it's expensive, and if you're going to shell out that much money, you might as well do things properly and get Visual C++.

### Borland Delphi

*The good points:* It's easy to use. Adding a new function to your program is as simple as dragging a button onto a form and typing the relevant code into the function that is

neatly created for you. It's got a nice editor, and the finished programs are fast, self-contained and small. It's also cheap, at about \$150 for Delphi Standard, which includes a 16-bit version for writing Win 3.1 apps.

*The bad points:* You have to code in Pascal, which is a bit like driving a pea-green Reliant three wheeler. There's nothing actually wrong with it, but C++ programmers will laugh at you behind your back. The included components aren't very configurable, giving your apps a bit of a 'construction kit' look to them. Also, I don't know if they've fixed this in version 3, but some of the docs for version 2 were distinctly patchy.

On the whole, this is the one I would recommend. You can create a fully working windows program with about six mouse clicks and one line of code. Virtually all of the 'housekeeping' code is done for you (although you are free to edit any or all of it yourself), so all you have to write is the interesting stuff. The price is right, there aren't any distribution hassles, it's fun and easy to use, and if you can live with the social stigma of being a Pascal programmer, you're set. ♦

Got any computer queries? Whatever is bugging you, from hardware problems to C programming, send it in and we'll soon have you fixed up. You can email your question to [electaus@magna.com.au](mailto:electaus@magna.com.au), or fax or mail it in to us here at EA.

# THE TIGER COMES TO AUSTRALIA

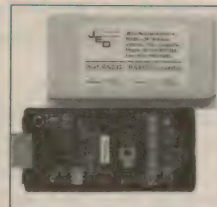
You've seen the BASIC Tiger and Tiny Tiger advertised in the US magazines: they are now available in Australia from JED.



Tigers are modules running true compiled (not tokenised), Multitasking BASIC at 20 Mhz, but only draw 45mA. They have memory, 4 x 10-bit analog inputs, digital I/O, two serial ports, RTC, and are superb small controllers for scientific and industrial applications. A Tiger with 128KB FLASH, 128KB CMOS RAM and RT clock costs only \$145. A development system (W95), with a proto board, is only \$245. JED has a local board/controller with LCD/Kbd and industrial I/O.

See our www site or call for data sheets.

## RS232 to RS485 Converter



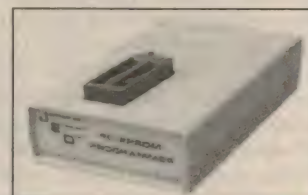
The small plastic case 100mm by 55mm by 25mm is an Australian-built RS232 to RS485 optoisolated converter. It connects a PC or PLC RS232 serial port to a multidrop RS485 differential cable up to 4,000 ft long.

The J995X converter has an internal microprocessor to automatically connect the transmitter to line, so the user program need not use the RTS line for RS485 TX control.

Cost \$160 plus \$20 plug pack.

## \$300 PC-PROM Programmer Also: \$145 Eraser with timer.

This programmer plugs into a PC printer port and reads, writes and edits any 28 - pin or 32 pin PROM without needing special plug-in cards.



JED Microprocessors Pty Ltd  
[www.jedmicro.com.au](http://www.jedmicro.com.au)

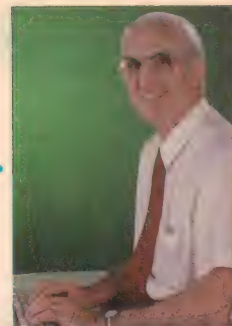
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Fax 03 9762 5499

(prices do not include freight or sales tax.)





## Comments from other medicos, regarding those 'alternative electrotherapy' devices...

Until a little while ago, there had been very little positive feedback in response to our look at some of the more way-out electronic gizmos claimed to cure everything from cancer to athlete's foot. Most of the feedback was quite critical, as you may recall. However I've now received more support from readers who are also qualified medical practitioners, and I'm presenting some of their letters this month.

**W**hile I confess the sheer volume of the initial wave of 'negative feedback' following the January and February columns was a little surprising, I wasn't really expecting a great deal of explicit positive support either — from medical people in particular. Apart from anything else (like having to spend most of their waking hours looking after patients), I imagined they'd be like me — assuming that the wackiness of many of the devices would be self-evident, and not need much reinforcement.

Of course the whole idea of us 'shining the light' on these devices came from a retired nurse ('Cheryl') in the first place, and you may recall from the May column that a medico friend of mine had been happy to offer his opinion on some of the devices and the claims made about them. We'd also had some very positive help from Bruce Morrison and his people at John Hunter Hospital in Newcastle — so I certainly hadn't been left on my lonesome, to fight off the revenge of the gizmo supporters!

That being the case, though, it was still a pleasant surprise to receive some quite supportive letters from readers who are also qualified medical practitioners. Apart from anything else, I didn't know we had all that many medico readers — let alone some that have actually found the time to write...

But let's begin. The first letter I'd like to present came from a medico in Western Australia, who has provided his full name and address as a sign of good faith, but asked me to describe him as 'Dr Nose Best'. As you'll see Dr Best is qualified in engineering and science, so perhaps it's not surprising that he's an EA reader. In any case, he makes some very frank and honest comments, which I for one found very interesting indeed. See what you think:

Dear Jim,

I am a long-time reader of EA, a GP of 20 years experience, also with a Masters in Biomedical Engineering, and an honours science degree. I'd like to offer my views on the place of 'alternative' medical treatments.

*You can divide medicine into three parts: complex problems which need high tech and expensive facilities for a cure; simple problems which usually need simple treatment; and chronic problems which may need a mixture of both. By far the commonest problems are the simple and chronic ones, which GPs spend most of their working lives dealing with, and which I want to discuss here.*

*It sounds glib and cynical (but isn't) to say that a GP deals with simple problems by occupying the patient while they get better; and with chronic problems by making the inevitable bearable. The more years I am in practice the more I see that patience, care and understanding are vital adjuncts to the treatment of 'just waiting for something to get better'. This doesn't mean doing nothing — far from it — but it does mean making sure the diagnosis is correct, and making sure that no harm is done to the patient while they recover. And this includes harm from conventional medicine as well as the so-called 'alternative' and 'natural' therapies that you are investigating in EA.*

### Easy to be fooled...

*It is easy to be fooled into thinking a treatment is working. There is a natural improvement and worsening built into most illnesses. Symptoms wax and wane with time: short and medium term illnesses over hours and days; chronic diseases over months and years. Furthermore a patient's view of their illness changes as their life circumstances change — symptoms that seem overwhelming one night will seem different the next morning.*

*The natural cycle of an illness tricks many into thinking a treatment is effective. Just because a patient is undergoing treatment while their illness gets better is no guarantee that the treatment is doing anything at all. In fact the enormous cost and effort of scientific medical research is dedicated to separating cause and effect so that we are not fooled by plausible-sounding treatments.*

*Sadly though, patients are ridiculously*

*easy to fool. Most people know almost nothing about the workings of their bodies, and they are often desperate to be cured. This is particularly obvious when they have a chronic or incurable disease which conventional medicine has failed to fix. They think it seems wrong that medicine works so well for other people, but does so little for their own illness. It seems right to the patient that they should keep looking for a 'cure'. And it seems obvious that they have found a cure when their disease gets better — even though this improvement may have happened anyway.*

*Part of the effectiveness of a 'cure' involves money. The more a cure costs, the more it is likely to be thought of as successful. This is simply because people don't want to admit — even to themselves — that they have wasted their money.*

*So how DO you cure people?*

*Let me tell you how easy it is: you eliminate all the obvious illnesses that need acute or high tech medicine (broken legs, heart attacks, pneumonia and so on). Then you assume a sympathetic and helpful manner. Appear to be wise and knowing. Also have some plausible, mysterious and complicated explanation which implies that you know enough about the problem to 'fix' it.*

*Sound familiar?*

*Now all you have to do is charge the patient a decent amount of money and then wait until the disease starts to get better before asking how they feel.*

*Sound cynical? Nope, it's what many well respected doctors have been doing for years. It is part of the art — not the science — of medicine. (The science of medicine comes in making sure this technique is used with the right patient, for the right reasons, at the right time.)*

*Unfortunately the technique has a very high success rate. It works just as well if used by a complete charlatan offering complete nonsense, rather than a capable doctor practising careful medicine.*

*What can be done about the charlatans?*





Not much. Most of the so-called treatments and so-called theories are obvious nonsense and not worth bothering with. Once in a blue moon there is something in a crackpot theory, but medical science is just too difficult and too expensive to search far into the intellectual wasteland of 'alternative medicine'. The chances of success are far greater in the fields of conventional medicine.

The only hope for reliably effective medicine lies in the scientific method — a fancy name for not kidding yourself. But it is painstakingly slow, can breed a cult of arrogance, and often stumbles. Nevertheless it does expose faulty thinking and it discards failed treatments. It's the best we can do, and by and large it works well.

Any fool can see that medicine is fallible. A lot of fools do. Unfortunately they then turn to pseudoscience for help. Not surprisingly, some of them get it. But 'let the buyer beware'.

Thank you indeed for those comments, 'Dr Best'. What I found especially interesting was your explanation of the way that 'simple and chronic' ailments need to be treated, and also the way many illnesses 'wax and wane' anyway, for a variety of reasons. This does help in understanding why even the most wacky of the 'alternative electrotherapy' devices seems to have supporters who are firmly convinced of its efficacy.

Your suggestion that the likelihood of peo-

ple believing a 'cure' has worked is roughly proportional to the money it has cost also rings a bell, too. It reminds me strongly of the situation with those very expensive loud-speaker cables, and the people who are absolutely positive that they can 'hear the difference'. (I certainly couldn't, but then I didn't outlay the necessary \$2000-odd!) As you say, people don't want to admit they've wasted money, even to themselves. We humans have pretty fragile egos, don't we?

### "Doing no harm"

Let's move on, though, and look at the second letter. It comes from Dr James Moxham, of Glenalta in South Australia, and he too makes some very interesting comments — especially about some of the devices we've looked at:

Dear Jim,

I have been following with interest your articles on alternative electrotherapy devices. I almost get the impression in your April column that you think you may have been wrong. Perhaps this is because you have been inundated by critical mail, with no supportive letters.

Don't despair! You were quite right in your first articles to question these devices. You are not the only person left who has an inquiring scientific thinking mind.

As a medical practitioner I am constantly confronted with alternative therapies. Most

doctors take the view that patients are free to spend money with these people if they wish, as long as no harm is done.

I have seen many cases of this in the area of oncology, where people are desperate for hope. Shark cartilage enemas are a prime example, where people fly to Mexico and spend more than \$20,000 on these treatments. Perhaps the people supplying this treatment offered a spiritual hope that western medicine could not provide when it diagnosed incurable cancer. Such treatments don't do any harm apart from emptying the wallet.

Of more concern are blood cleaning therapies you discussed. A 27V square wave applied to the body would be the holy grail of medicine if it could kill bacteria and viruses but not harm any human cells. I am reminded of a patient with HIV who took this one step further and flew to Asia at great expense to have a similar treatment, only the current was applied to his blood after it had been removed from his body. The blood was then transfused back. He developed septicaemia, and his vital signs were subsequently extinguished.

Cardinal rule of medicine — first do no harm.

One of the secrets of medicine, known by witch doctors and modern doctors alike, is that the placebo effect works. Innumerable studies have shown that when comparing a sugar pill to a drug being tested, the sugar



## Forum...

pill will have some beneficial effect. The test therefore is not whether your new drug or treatment works, as it almost certainly will for a lot of people, but whether it works better than a placebo.

The gold standard in medicine is the double-blind controlled trial, where not only does the patient not know whether they are taking placebo or active treatment, but the doctor does not know either.

If there is one thing that separates mainstream medicine from alternative medicine, it is that almost all alternative therapies do not have a double-blind trial to prove their claims. It almost has to be this way — if a new alternative treatment is found to work with a double-blind trial it gets adopted more widely, and then becomes mainstream, i.e., not alternative.

The placebo effect tells us therefore that almost certainly the electronic devices you have been describing will work, that they will do almost unbelievable things. And remarkably, they will work whether they are switched on or off. But they will only work if those promoting them say they will work.

I am reminded of a tale I heard from a psychiatrist who spent six months in the jungles of Borneo, and who was immediately accepted into the community after he told them he was known by his people back home as a 'headshrinker'. The now reformed cannibals had embraced both western and alternative medicine. The standard treatment for a belly ache was to read the chicken entrails, which our psychiatrist friend got quite good at. If this didn't work, a trip to the hospital was in order, and if the clever western doctors couldn't work it out it was back to the chicken entrails. By this time the

belly ache was usually better, which was the ultimate aim anyway.

So don't worry too much about people who want to be cured by holding on to 555 timers, or by impressive devices with lots of knobs which are not wired up at the back. They know that in this high tech modern world we need to move on from primitive rites involving chicken innards.

It is all a matter of faith, really. [Faith (n): belief which is not based on proof.]

Thanks for those comments too, Dr Moxham. I like your point about most medicos being prepared to tolerate 'alternative therapies', providing they at least do no harm to the patient's health — as opposed to their wallet. Frankly I suspected as much, and it was therefore surprising that so many of the defenders of 'alternative therapy' devices seemed to be firmly convinced that traditional medicos were purely worried about their potential loss of income...

I also liked your reminder about the placebo effect, and how powerful it can be. Also your point about many of these devices being little more than 'high-tech' replacements for magic chicken entrails. So thanks again for your support!

### Not far enough?

In case there was a risk that I would let all this positive support go to my head, there was another letter — and this time a fairly critical one again. Not from a supporter of alternative gizmos, but from someone who believes we haven't gone far enough in exposing these devices.

The reader concerned is Chris Johnson-Walker, of Grafton in NSW. Here's what he has to say:

Dear Jim Rowe,

If you want to get stuck into bogus health technology, why don't you take on one of the big guys — the Vega machine. (Or is it Vega?) This is a computerised device that tends to be present in the offices of non-poor naturopaths. (I know of two of them in Grafton, so there must be plenty in Sydney.) Having a consultation using this device will set you back \$100 or so. The device purports to diagnose allergies and god knows what else. You are wired up to the thing and it produces various pronouncements.

I am willing to bet that the device generates some kind of 'fingerprint' of your body using capacitance or resistance. (Something which is vaguely repeatable, so the readings don't change within five minutes.) Then it probably assigns random allergies and problems to that fingerprint, in an order which is designed to create the least suspicion. For example, everyone who steps into the office of a naturopath is willing to believe that they are allergic to milk. So no one would be surprised if the machine revealed this about 80% of the time. Other popular allergies like coffee, tobacco, corn, grasses, pollen, dust mite, housepaint etc are probably revealed slightly less frequently.

Nevertheless, all things which people are likely to believe, but usually hard to verify in practice, since you can't subtract most of them from your environment anyway! From what I have heard, the patient is extremely impressed with the ease at which this machine uncovers swathes of hither-to unsuspected ailments.

The 'treatment' of bogus conditions features highly in naturopathic circles, just as it does in conventional medicine — but we won't go into that this year. Ideally, the patient should never really be sure whether they are cured of it or not. It's also important to have a few good excuses handy when the device produces results which contradict the patient's experience.

Fortunately, in the treatment of 'allergies' and intolerances, the subject is suitably convoluted to justify almost anything. Such entities as 'allergy masking' and 'allergy addiction' exist, and with these phenomena, a practitioner can obfuscate indefinitely.

As I have found, the gullibility of the 'enlightened' ones who live around here, and no doubt plentifully in Sydney, is near infinite. So the degree of guile necessary to produce a machine which would convince them would not be great. I believe the machine was developed in 'Germany', and so is beyond question. For as we know, the 'Germans' are an advanced bunch, and are almost as clever as the 'Swedish' when it comes to being enlightened. Nevertheless, both countries are far away, and to an Australian, this is very mystical.

I suspect that the machine would vary in its diagnosis if a person lost some weight or was sweating a bit more. Possibly the placing of a foot in a bucket of water, or the crossing of one's legs would produce different results. It would depend on exactly how it worked. I am sure the viga machine works on fairly simple principles, but it has plenty of software in it to make its debunking a little difficult. Some imaginative person has to get near one of these precious toys and have a play with it in the absence of parental supervision...

I leave this in your culpable hands. I would like to see an article done on it. The Skeptics haven't said anything about it, and neither has anyone else. It's yet another one of these highly obvious stupidities which propagate indefinitely. Only the supreme turkeys get sucked in by the devices you are currently debunking. But the viga machine sucks in swathes of people who are supposedly intelligent. It's marvellous how credulous people become if a procedure looks a bit impressive.

Hmmm — thanks, Mr Johnson-Walker. It does sound as if the device concerned has a fair bit in common with 'magic chicken entrails', so if we can find out more about it, I'll be happy to explore it further. We haven't been avoiding it on purpose; I simply hadn't heard of its existence...

But that's all we have space for this month. See you next time? ♦

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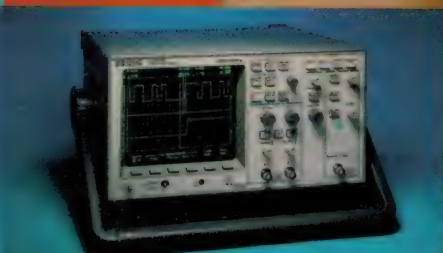
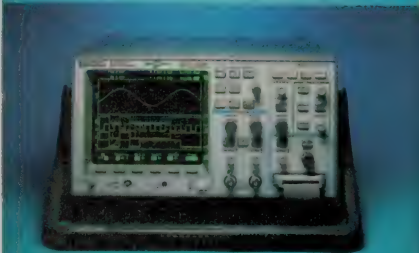
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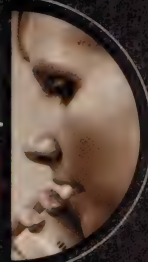


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# Serviceman



**I'm SURE my new breadmaker is faulty, because the loaves won't rise!**

**How much free advice should a service technician be expected to give — especially about matters that are really nothing to do with electronics? That's the question raised by our first story this month. There's also a tale about a music keyboard that emitted blood-curdling crashing sounds, and another about service manuals that simply don't tell you what you need to know...**

**O**ur first story this month is more of a 'Cry from the Heart' than a servicing story. It's all about training, really — training the customer in the use of modern high tech appliances.

When I began as a serviceman, most electronic equipment only had two controls: tuning and volume! Some sets also had a tone control, and the very top-end models boasted a shortwave band as well. It was only with the latter sets that we had to do any 'training' of the users. A brief comment about the need for a good aerial (antenna) to ensure good SW reception was usually all that was needed.

Then came television, and the need to train users in the proper use of fine tuning, brightness and contrast. This seemed to be an unwarranted intrusion into the rights of a service tech. We weren't paid for this instruction, and we had no one we could charge.

The refusal of Japanese manufacturers to employ qualified translators led to the issue of User Manuals written in 'Japlish'. In many cases it was useless to tell the customer to "read the manual", since not even a qualified technician could confidently translate some of the instructions...

Unfortunately, as electronic devices continue to become more complicated, the need for user instruction becomes ever more necessary. Setting up different channels on some

current TVs and videos is beyond most owners, so they call up the local 'muggins' and expect him to do the job — for free.

Sometimes it is possible to disguise 'instruction' as part of a real or imagined repair function, and so recover some of the lost time. But mostly, it's dead time that can only be recovered by increasing the charges on other, more successful jobs.

One thing about the preceding paragraphs, at least as far as I am concerned, is that 'instruction' has always covered electronic subjects, something I know a bit about. I have never had to teach a client how to, say, bake bread — which leads us into the subject of this month's first contribution.

It comes from a New Zealand serviceman who asks that his name not be revealed. I'll just call him Tony, and this is his tale of woe...

*I read the Serviceman's page in the February issue of Electronics Australia with great interest. In particular the subject of breadmakers caught my attention, because these are a pet peeve of mine.*

*I tend to specialise in the servicing of microwave ovens and, as they are also a home appliance, every week or so I receive a breadmaker for checking, usually under guarantee.*

*Just occasionally they have definite faults (usually mechanical) and these are of course treated as a normal repair. However the vast majority of complaints are just baking problems: 'bread not rising' — 'not cooking properly' — 'misshapen loaves', etc.*

*My difficulty is what to do with these complaints, as after routine tests and baking a test loaf, I have yet to find any true problems (often to the customer's great puzzlement).*

*We have to purchase the ingredients or keep them on hand. Yeast should be refrigerated once opened, and how many service companies keep yeast, flour and butter on their premises?*

*I have to spend time and physically test the unit, bake a test loaf, then phone the client and explain that the problems often lie with the ingredients or the way they are measured. This usually turns into lengthy discussions to try to determine possible causes for their difficulties.*

*The average time spent in these discussions is 30 - 40 minutes, but often more as the talk with the client can be quite pro-*

*tracted and sometimes heated. This is lost time, for which it seems I am unable to charge anyone...*

## **I'M not paying!**

*The retailer does not want to pay, and if I want to keep their goodwill, I can't insist. The importer (no names mentioned) will not pay, because it is not a fault that can be covered by a guarantee. And the client gets irate if I try to charge THEM, because they expect the guarantee to cover all manner of problems.*

*This is becoming increasingly common, and I wonder how other service companies handle this problem. For myself, after much thought, I decided to handle this type of complaint in the following way.*

*If I receive a breadmaker with a baking problem, I perform a quick functional test. This involves starting the breadmaker and two or three times during the cycle, I lift the lid and feel the temperature of the baking chamber.*

*If there is no apparent fault, I phone the client and explain this simple test and advise that there appears to be no apparent fault and what I have done so far will not be charged for.*

*If they insist that there is a fault (and most do, often in no uncertain way) I then offer to do a full test which includes baking a loaf. I explain that there will be a charge for this service, even if no fault is found.*

*The full test involves another dry run, but this time using a computer to log the temperature versus time. If all is OK I bake a loaf and this is returned to the client as proof that their machine is working properly. Most clients are quite incredulous and cannot believe that I couldn't fault the machine, even with the evidence in front of them.*

*In one case I was accused of baking a loaf in another breadmaker and presenting it as baked in their machine. Another time when I offered the full test, I was told that there was "No way they would pay any money" even though they were adamant that there was a true fault (in which case there would not have been a charge). They were not prepared to risk it.*

*In that particular case, the customer demanded their money back from the poor retailer who gave in and subsequently took*



I UNDERSTAND IT COST YOU A LOT OF DOUGH-BUT I NEED TO DO JOBS THAT'LL EARN ME MY BREAD AND BUTTER!



the breadmaker home to try, needless to say with perfect results.

With the complexity of modern electronic equipment, 'NO FAULT FOUND' situations are increasingly common in servicing and like most servicemen, I usually have to absorb these costs. Fortunately these are generally only a small percentage of overall repairs.

However with breadmakers, I find that NFF's comprise over 90% of all units that I see. I feel that there is a problem here that should be addressed, as it is difficult to see why the service company should be the 'meat in the sandwich'.

The preferable option would be for the importers of breadmakers to allow for one no-fault service claim of perhaps 30 minutes (or a fixed dollar amount) in the interests of good client relations.

In fact one major New Zealand importer/manufacture of powered garden equipment does exactly that, and because of the nature of breadmakers, I do not see why this is not possible for them.

Tony, my heart bleeds for you. I think we can all appreciate the bind you find yourself in. On the whole, you have probably made the right decision in demanding payment for your NFFs. The only thing remaining is to harden your heart about losing those clients who won't pay. You're probably better off without them anyway.

Which reminds me of one local service

company with whom I'm associated. They had always charged for quotes, but only collected when the client called back for the quote. Quite often the client "...didn't have that much with me" and that was the last anyone ever saw of them.

This company had a room full of unclaimed quotes and they agonised for months over what to do about it. Ultimately, they decided to collect for the quote up front. It took a steely nerve to face up to the client and tell them to "...take your TV home and come back when you've got the money for the quote". It's surprising how many people suddenly remembered their credit card, or the money they had stashed "...in the car".

The outcome of this practice has been the loss of only three customers in something like six months, and a dramatic fall in the number of uncollected quotes. There has also been a significant increase in the number of accepted quotes, so it's turned out to be a win-win situation, at least for that company.

Thanks for your story Tony, and if we hear of any other solutions to the problem, I'll try to cover them in this column.

### Crashing keyboard

Our next story comes from Mick Gillies, of Bittern in Victoria. Mick is a telecommunications technician and a keen musician. In this story he tells of resurrecting a piece of 'almost

Junque' — a valuable item that nearly went to the tip. Here's what he has to say...

I have been an electronic music enthusiast for many years, but being on a strict budget, I keep an eye out for any bargains that might come my way. On this particular occasion, I had purchased a second hand Yamaha YS200 digital synthesiser for only a fraction of its true value.

After patting myself on the back and gloating to my friends about my great find, I got down to actually using the keyboard, only to find my treasure had two serious intermittent faults.

Firstly, on powering up the unit, the backlit LCD would suddenly black every segment, making it completely unreadable. As this unit relies entirely on the LCD for feedback on all functions, this intermittent fault probably explained why the unit was sold so cheaply.

The second fault was just as distressing. For some reason, at varying intervals, the unit decided to emit a resounding crash at full volume, leaving me and the monitor speakers severely stressed — along with the cat dangling from any convenient light fitting and a shriek from my wife to 'turn that garbage down!'

Obviously I could not use the unit in this state, so I went about dismantling the case, only to be confronted with at least eight PCBs of varying sizes, most with numerous large custom LSI chips.

With no service manual or circuit diagram, I started by checking many possible causes, such as loose multi connectors or leaking electros. Then came my first break.

I noticed that putting any lateral force on the pushbutton power switch (which was soldered directly to the power supply PCB), sometimes fixed the LCD problem.

As the power supply had its own PCB, I decided to investigate all components for any mechanical damage or dry joints. All the passive components seemed OK, but I noticed the soldering around two large volt-

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## Serviceman

age regulators looked a little suspicious.

And there was the problem. As the regulators were not fitted with heatsinks, they had slowly unsoldered themselves and were just sitting in the holes of the PCB with an extremely tenuous 'push-fit' electrical contact on all legs. Any sort of movement or vibration in the vicinity of any of these legs brought on both problems without fail.

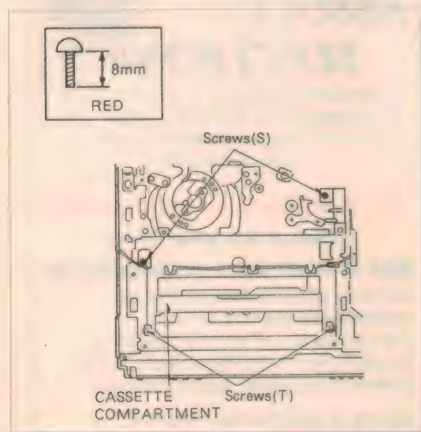
*I dread to think of what sort of voltages were coming from the regulators but thankfully, no permanent damage seemed to have been done. After resoldering and attaching heatsinks to both regulators, all faults disappeared and have not returned since.*

*With these regulators running hot enough to unsolder themselves, I cannot fathom why Yamaha did not have the foresight to fit a couple of heatsinks to start with. Their quality of design and construction is usually unsurpassed, and an omission of this kind quite uncharacteristic.*

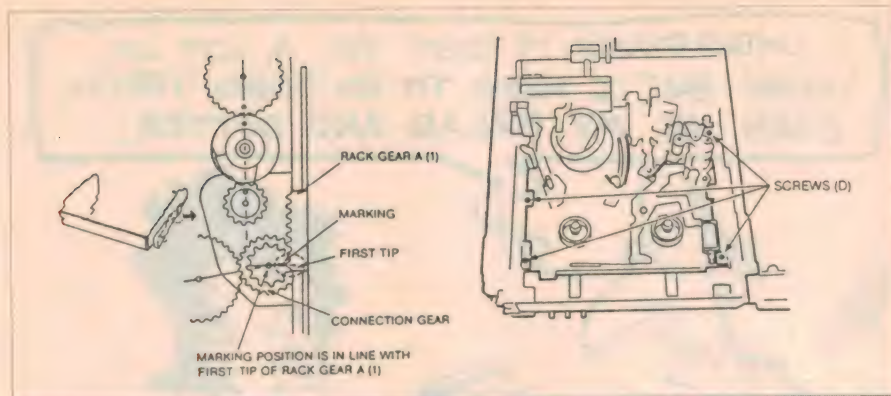
Since the cost of returning this particular keyboard to a service agent would have been more than I paid for it, I considered that any attempt on my part to repair it would be worthwhile. Luckily for me, the fault was both simple to find and easy to repair and I can go back to patting myself on the back for finding such a bargain.

Thanks for that story, Mick. It just serves to reinforce my contention that there is really far more *junque* than *junk* in our community...

Actually, in recent months we have had a lot of these kind of stories in this column, and I am beginning to wonder if readers might not be getting tired of the subject. On the other hand, these contributor's stories might persuade others to examine their junk more carefully before disposing of it. As your story shows, Mick, there is often little more than a dab with an iron needed to convert worthless junk to valuable junkie.



*Removal of the cassette compartment in the Panasonic FS-90 VCR is nothing like the procedure shown here in this model's manual.*



*These are the drawings that should have been given in the FS-90 manual. They come from the G-II mechanism manual and are much more explicit. Drawing A25 shows the easy way to extract the cassette holder, with cassette carrier removed, while A24 shows the correct cog setting.*

### Unhelpful manual

Now before I finish for this month, here's a short note from my own workshop.

I've mentioned here before that I use some top-end domestic Super-VHS gear for video editing. The main decks are Panasonic FS-90s, and generally they have given super service.

Unfortunately, a few weeks ago one of them spat the dummy and refused to do anything. I was preparing to watch an old video when the machine tangled the tape and stopped working.

In detail, it had accepted a tape but would not play. Then it was reluctant to eject that tape, after which it would not accept another cassette. It would start to load, then would eject the cassette and switch itself off. E-to-E operation was OK, so long as I didn't try to insert a cassette. Then it would switch off and the E-to-E would stop...

My first guess at the trouble was that something had broken in the cassette carrier, so I took the machine down to the workshop and opened it up. I couldn't see anything amiss while peering into the top of the works, so I decided to remove the carrier for a closer examination.

The FS-90 uses a G-II mechanism which is usually very reliable, although it is reputed to offer some assembly and timing problems during service. The service manual also suffers badly from an attack of Japlish and is very difficult to understand.

The manual tells how to remove the top plate, then remove two screws, slide the carrier back to reveal two more screws which are removed to release the whole carrier assembly. Which is all hogwash...

After the top plate is removed, the moveable part of the carrier will pop out of the frame, to reveal all four screws which secure the frame. Once you've seen it, it's easy — not at all as the manual describes it.

Anyway, I carefully examined the assembly but could find nothing apparently broken or misplaced. If there was a fault, it was a very small and obscure one.

I decided to reassemble the carrier and see if the fault was still present. I replaced the frame and the four fixing screws. The carrier slots into the frame, in two spring loaded-grooves that are not easy to position with only three hands.

After reassembly, the cassette carrier wouldn't move at all. Obviously I had something out of place, but I had no idea what. So I took it all apart and tried again.

This time I looked more carefully at the carrier timing diagram in the mechanism manual, rather than in the chassis manual. This showed a mark on the loading gear, which had to be set opposite the first tooth on the rack gear. But it doesn't say which end of the rack is the 'first' end. I had used the one nearest the back of the machine, but this might have been the wrong one. So I tried the other end.

This required me to push the carrier into the 'cassette down' position, and then all became clear. The mechanism was in the Stop position when the frame was installed, so naturally the carrier would be *down*.

It just goes to show that having the right manual for the current model is not always enough. There are often manuals for other bits and pieces that are vital.

After this, everything went back into place without any more problems and when I tested the machine, it worked perfectly. It's still working perfectly today.

As far as I can tell, the problem was nothing more than a 'slipped cog'. The cassette loading gear had probably slipped one tooth along the rack gear, and that's all it took to foul up the whole mechanism.

A fault like this was just annoying at this time, as I was only viewing an old off-air tape. But if I had been working on a client's videotape when this happened, it would have been a calamity. I was lucky this time, but I hope it doesn't happen again.

That's all for this month. I have a couple of stories for next time, but then nothing. What about that story *you've* been promising to write for months? Now's the time to do it. And it will be worth your while, too. ♦



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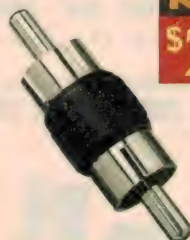
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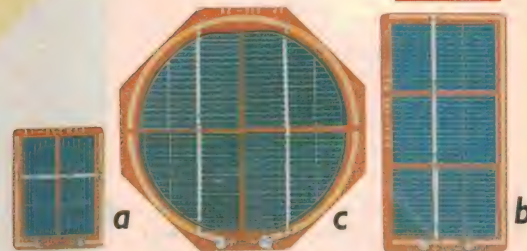


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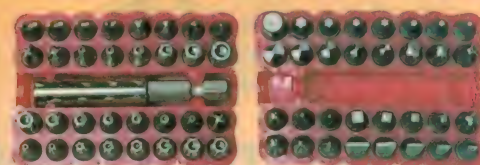
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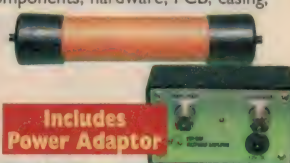
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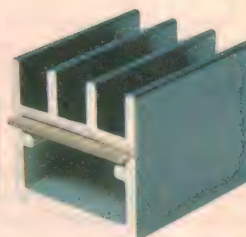
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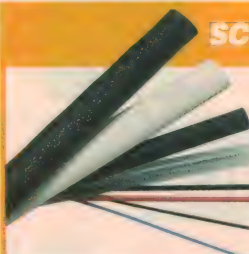
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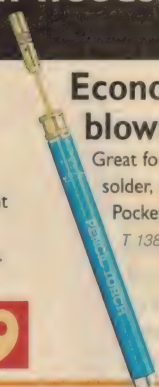
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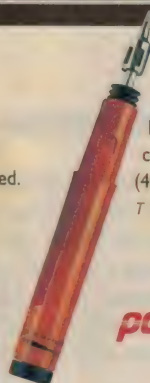
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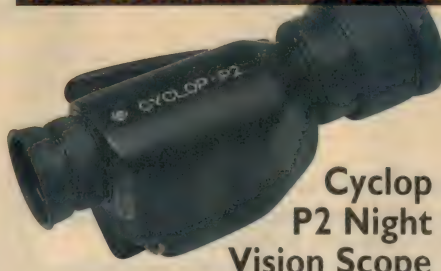
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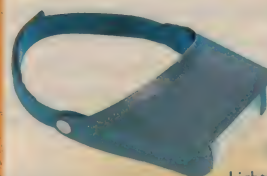
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# Circuit & Design Ideas

Interesting original circuit ideas and design tips from readers. While this material has been checked as far as possible for feasibility, the circuits have not been built and tested by us. We therefore cannot accept responsibility, enter into correspondence or provide any further information.

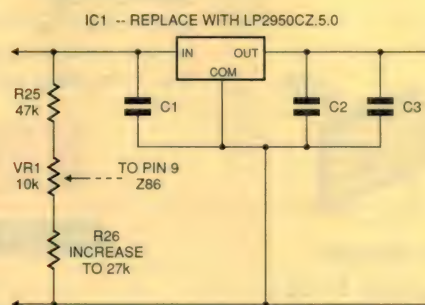
## Longer life for the ESR meter

After building the ESR meter described in the January 1996 issue of *EA*, I realised that the battery life could be extended by using a more suitable regulator. I replaced the 78L05 (IC1) with a LP2950CZ-5.0, a pin for pin replacement with a dropout voltage of just 0.6V. This will allow the battery to discharge to 5.6V before the unit is affected (instead of 7.0V with the old regulator), and so the low voltage warning trip point will have to be altered. This is achieved simply by increasing R26 to 27k.

The LP2950CZ-5.0 is available from RS components, and the added cost of the regulator will soon be recouped in batteries saved.

G. Freeman

Nairne, SA \$30



## Photographic timer

There have been many circuits published over the years for simple photographic timers, but it's funny how you can never lay your hands on one just when you need it. At last I decided that it shouldn't be too difficult to achieve such a basic requirement using only a handful of easily available bits, and so I designed my own circuit.

The circuit consists of a 1024Hz oscillator IC1a/b and associated components, a 1024-count divider IC3, a pair of divide-by-10 counters ICs 4 and 5 wired in cascade and with associated time interval selection switches, an end-of-count detector IC2a, and

a control latch or flip-flop IC1c/d. The output of this latch switches the load through a relay via buffers IC2b/c and Q1.

At power up, the counter ICs are reset due to a high being fed to both reset pins before C3 charges via R6. Once C3 has charged (about 50ms) both counters are enabled. This initial high is also fed to IC1c pin 8, and since IC1c pin 9 is also high via R2 the latch is put into a reset state with outputs pin 10 low and pin 11 high.

With ICs 4 and 5 reset, all outputs are low, therefore IC2a pins 1 and 2 are low and pin 3 high. This high applied to IC1d pin 13 has no effect on the state of the latch. The low on IC1c pin 10 inhibits operation of the 1024Hz oscillator IC1a/b and associated components. This low also prevents operation of

the relay and hence the load.

When the start button is depressed, a low is fed to IC1c pin 9 which sets the latch to high on pin 10, and low on pin 11. The high on pin 10 enables the oscillator and also energises the relay. The oscillator output is now divided by 1024 in IC3 using its Q10 output, which is also used to reset the divider ready for the next 1024 pulses.

The result is a fairly accurate 1Hz pulse train being fed into the decade counters. These counters are cascaded with the carry output of IC4 (seconds) being fed into the clock input of IC5 (10's of seconds), which results in a maximum count of 99. The decade outputs are selected by two 10-position rotary switches, so that time durations of 0 to 99 seconds may be chosen in one second increments.

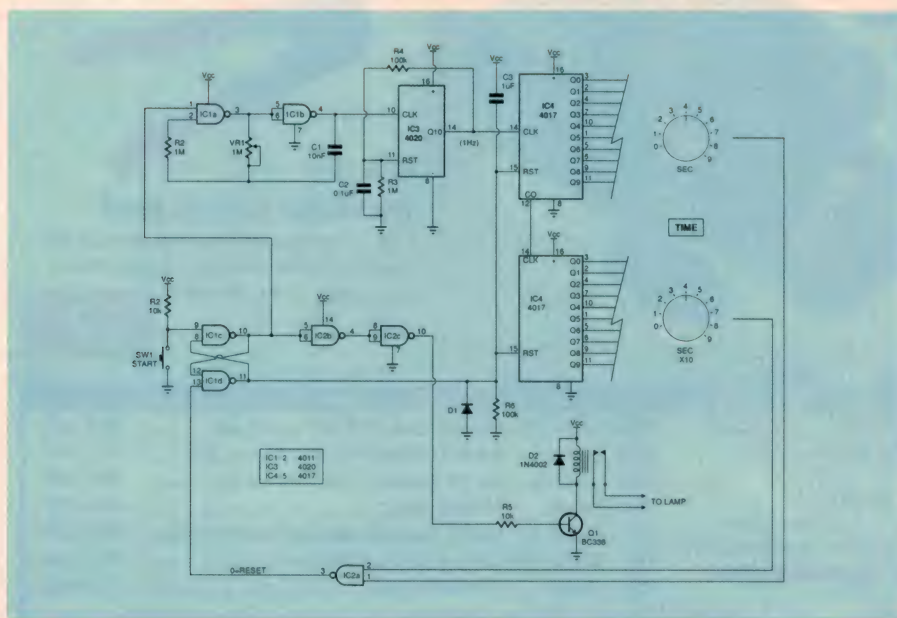
When both switch outputs are high, then we have reached the selected time interval, and a low results out of IC2a pin 3. This low resets the control latch, the oscillator is inhibited once again and the relay is de-energised. The high from pin 11 of the latch is used to reset the decade counter ready for the start of another timing cycle.

I used a frequency counter to adjust the oscillator to 1024Hz, but if one is not available, I would suggest dialling up a 90 second or so time interval and using a stopwatch. Adjust the oscillator frequency as near as possible to achieve the 90-second period.

The circuit need not be run from a regulated supply rail (I used a 9V battery), since the fairly minor frequency shift of the oscillator with changing supply rail is divided by 1024, the resultant variations in timed outputs becomes negligible.

K. Pearce

Auckland, New Zealand \$45





As an added incentive for readers to contribute interesting ideas to this column, the idea we judge most interesting each month now wins its contributor an exciting prize, in addition to the usual fee. The prize is a complete closed circuit TV system, comprising a 5" B&W video monitor, CCD video camera with stand, power supply and cabling. This system comes from our sponsor Allthings Sales & Services, and is valued at \$369.00!

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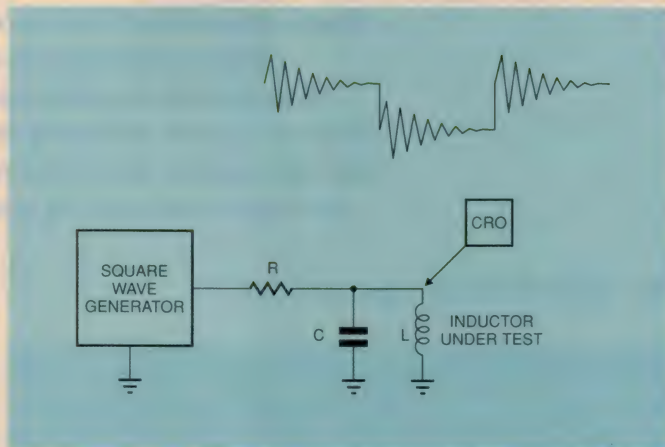
## Simple inductance measurement using a CRO

I recently had to measure a number of inductors, and didn't have an inductance meter handy. While a number of these units have been presented over the years in *EA*, I didn't have the time to dig up a design, build and calibrate it. Instead, I thought up this simple way to do it, which your readers may find interesting.

The values of R and C are chosen to give highly underdamped behaviour, with the oscillation frequency significantly greater than the square wave frequency. Theory then shows that for response to a step change, **period** =  $2\pi\sqrt{LC}$ .

This can be solved for L as **L** = **period**<sup>2</sup>/4 $\pi^2$ C, where period is the period of the underdamped oscillations as seen on the CRO.

Richard van Wegen  
Glengowrie, SA \$30



## Linking smoke alarms

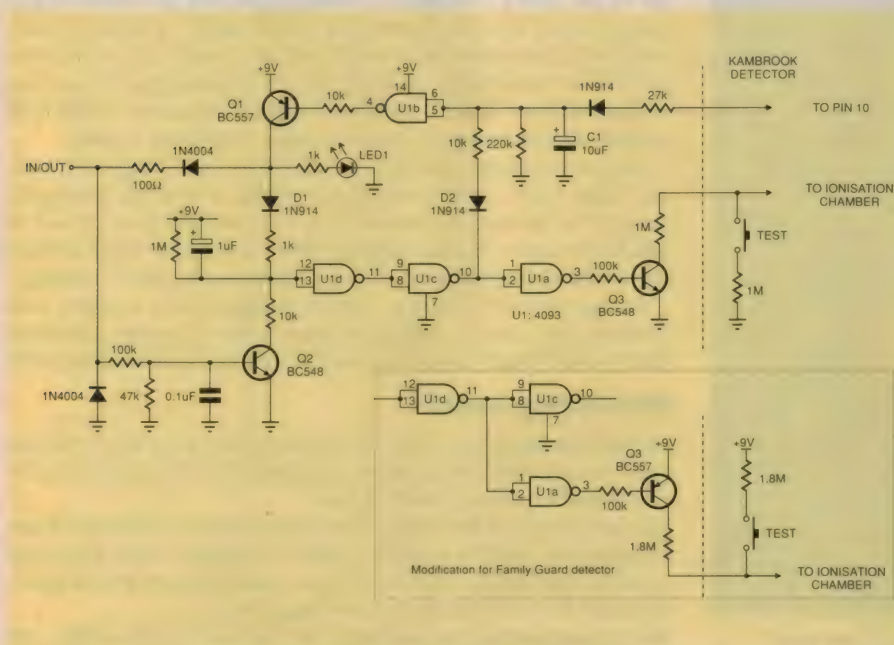
This circuit can be built into inexpensive smoke sensors to enable them to be interconnected. If one of the detectors senses smoke and is activated, it will cause the other detectors to activate their alarms as well. This circuit can be installed in the Kambrook model SD15, but with the changes shown in the circuit diagram, it can be used with the Family Guard model FG888DCAUS instead.

When an alarm is activated, pulses come from pin 10 of the IC in the detector, which charges C1. Pin 4 of the 4093 then goes low and turns on Q1, which supplies 9V to the interconnect cable at the in/out terminal to trigger the other detectors. As well, LED1 will light to indicate the detector that first became activated. (D1 is used to disable the input during this time.)

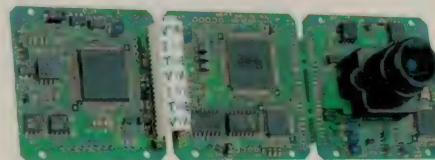
If 9V appears on the in/out terminal from another detector, Q2 is turned on, which in turn causes Q3 to activate the test function of the detector, causing the alarm to sound. D2 prevents the output section from turning on while this is happening.

R. Griffiths  
Rochester, Vic \$30 ♦

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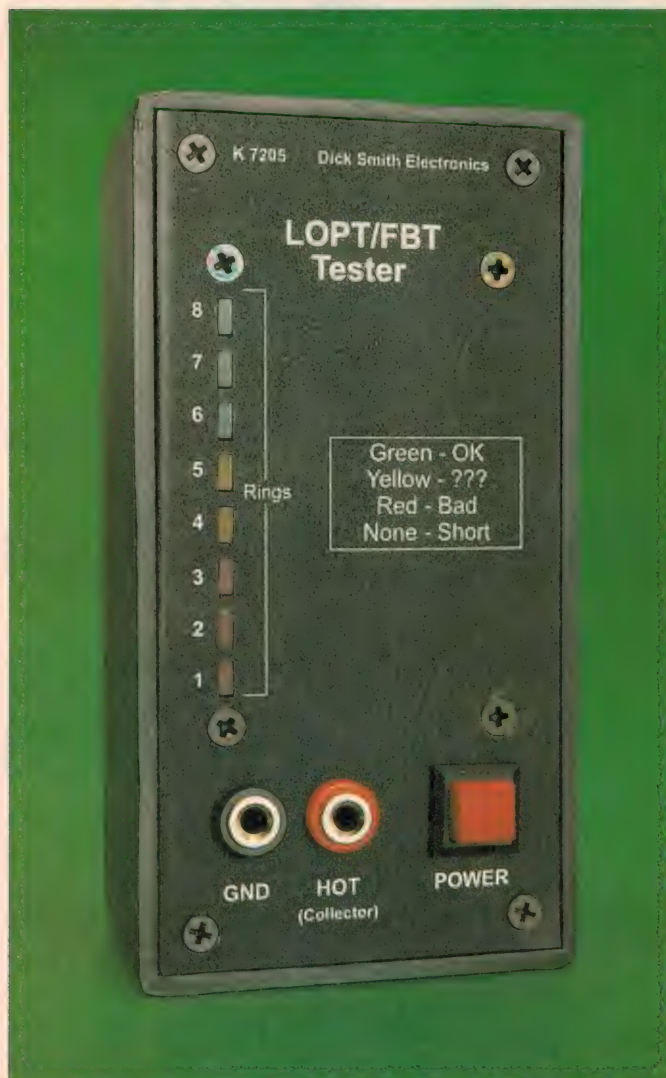
READER INFO NO.13



# In-circuit LOPT/FBT Tester

Here's the design for a low cost, easy to build and use battery operated 'shorted turns' tester for line-output or 'flyback' transformers, and other HF wound components like deflection yoke windings and SMPS transformers. Tests have shown it capable of finding at least 80% of LOPT/FBT faults, so it can save a lot of time and trouble. Small and rugged, it's well worth a place in the toolkit of anyone involved in servicing TV receivers, video monitors and computer power supplies.

by Bob Parker (and friends)



A prototype tester, shown slightly smaller than actual size.

If you're reading this, then chances are that you're a TV and/or computer monitor repair technician — who doesn't need to be told that horizontal output stage faults cause more than their fair share of headaches! Operating at high voltages, frequencies and power levels, many components in this part of the circuit are highly stressed, and failures are not only common but their cause is often hard to identify.

The usual symptom of a major horizontal output stage fault is a serious overload of the DC power supply feeding the primary winding of the line output transformer, or 'LOPT' for short (called the 'flyback' transformer or 'FBT' in North America). This is often accompanied by a collector-to-emitter short circuit in the horizontal output transistor or 'HOT'.

(For consistency, I'll be referring to the line output transformer as the 'LOPT' throughout this article — North American readers please mentally substitute 'flyback' for this term!)

Any of quite a few possible components could be the cause of such a failure, the more common being one of the high-speed rectifier diodes fed by the LOPT's secondary windings, including the diode stack(s) which produce the extra-high-tension (EHT) supply of around 25 kilovolts for the final anode circuit of the cathode ray tube. It's also possible the HOT has failed simply from old age or overheating due to unevenly-applied/solidified heatsink compound. Another occasional culprit is an insulation breakdown in the deflection yoke's horizontal winding.

However the failure which service technicians dread is a shorted winding in the LOPT itself. Unfortunately LOPTs tend to be specifically designed for the make and model of the TV or monitor they are used in, which can mean a lot of hunting around for a replacement. In addition they are hardly ever cheap, and not always physically easy to replace.

In short the LOPT is **not** a component which is easy to test by substitution, and a service technician needs to be as certain as possible that the LOPT really is defective, before tracking down a replacement!

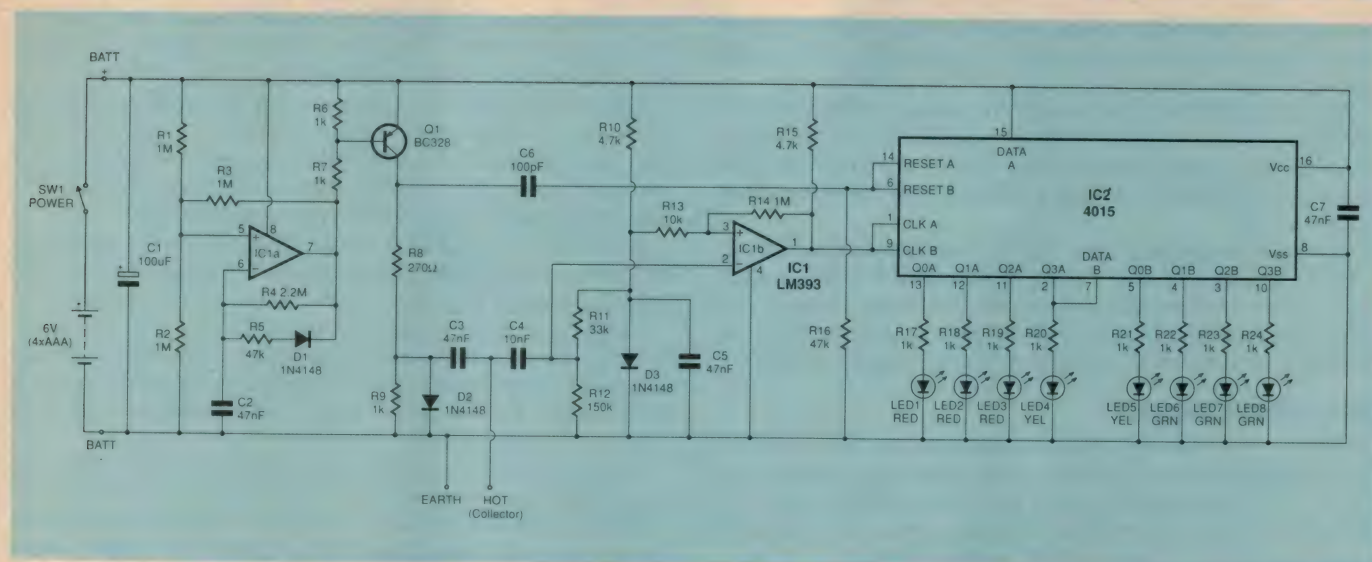
## Identifying faults

Several techniques have been developed over the years for identifying faults in horizontal output stages, and testing LOPTs in particular for the presence of shorted winding turns.

The components in the horizontal output transistor's collector circuit, including the LOPT's primary winding, deflection yoke horizontal winding, and tuning capacitors form a reasonably low loss (high Q) resonant circuit, especially at low voltage levels.

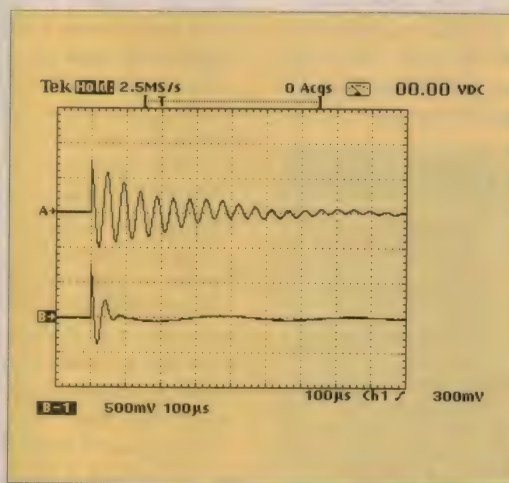
Most testing techniques, including the one used in this design, are





based on the fact that nearly all serious faults in the horizontal output stage will greatly increase the losses in the LOPT's primary circuit. That is, they lower the Q.

I should also point out here that because Dick Smith Electronics gave me considerable help in developing this project, commercial kits for it will only be available from them.





ing input as a reference voltage, via R13. R14 produces a small amount of positive feedback around IC1b, ensuring that its output switches cleanly between its low and high voltage levels.

The result of all this is that an inverted and squared-up version of the ringing waveform appears at the output of IC1b, until the ringing amplitude has decayed down to about 15% of its initial value. This square wave is connected straight to the clock inputs of shift registers IC2a and IC2b.

**3. The LED bargraph display:** IC2 consists of a pair of identical four-bit serial-in/parallel-out shift registers, connected to form a single eight-bit unit, with each output driving one LED in the 'bargraph' display via resistors R17 to R24. The serial data input of the first stage (pin 15) is permanently connected to the positive supply, or logic 1.

## One measurement

For the first 5µs after the commencement of a new 2ms measuring pulse, both shift registers are reset to zeroes on all outputs, as described earlier. At the same time the initial positive pulse applied to the LOPT drives IC1b's output, connected to both shift registers' clock inputs, to a low (logic 0) level — unless the test leads are shorted.

If the LOPT primary circuit is OK, it will ring during the next several hundred microseconds. For each ring above about 15% of its initial value, it will cause a high-going pulse to be applied to the shift register clock inputs, resulting in the logic 1 on IC2 pin 15 being moved one shift register stage further along. It doesn't matter if the LOPT rings more than eight times — all LEDs will still remain illuminated.

So the overall result is that one LED illuminates for each LOPT ring cycle above 15% of the initial level, and this condition remains until the start of the next 2ms measuring pulse. Phew!

## Usage & limitations

In order to assess the usefulness of this design, I gave several prototype LOPT/FBT testers to technician friends to evaluate for many months, then asked for their comments and thoughts on how to put the tester to best use.

The first response is from Larry Sabo, an experienced monitor technician in Ottawa, Canada who also suggested the front panel layout:

*One of the first things I do to check out a monitor is connect the tester between the HOT collector and ground. If no or only a few LEDs light, I check the HOT, damper diodes and tuning caps for shorts using a DMM. If these are OK, I check for an open fusible*

*resistor in the circuit feeding B+ to the LOPT, and for shorts/leakage in diodes on the LOPT secondaries. I also check the bypass capacitor on the DC supply to the LOPT primary for excessive ESR.*

*If these check OK, I ring the horizontal yoke with its connector unplugged. It will normally ring seven times on its own. If the yoke rings OK, I unsolder all but the LOPT primary winding and ground pins, and ring the primary. If the primary still rings low with everything else disconnected, the LOPT is probably defective.*

*Most LOPTs on their own will ring 8+ times, but some ring only four or five, even when they are perfectly normal. So it is prudent to confirm the diagnosis by ringing an identical known-good LOPT, if at all possible.*

*Sometimes an LOPT is defective, but still rings normally with the tester, e.g. due to leakage or arcing that only occurs at full operating voltage. The problem will sometimes be manifest by heavy loading of the B+ supply, spurious ringing and/or reduced voltages on the HOT collector, or excessively high EHT resulting in HV shut-down.*

*Because this tester uses impulses of only 650mV to minimize the forward biasing of semiconductors, such defects will not be reflected in the ring count. Under these circumstances, I check for measurable leakage resistance between the EHT cap and the other LOPT pins. It should be unmeasurable, otherwise the LOPT is defective.*

*If I have gone through the above tests and have these symptoms and a normal ring count on the tester, the diagnosis can usually be confirmed only by substituting a known-good identical LOPT, or by testing with a chopper similar to the one described in Sam Goldwasser's Electronics Repair FAQ, located on the Internet at [http://www.paranoia.com/~filipp/REPAIR/F\\_Flyback\\_tst.html](http://www.paranoia.com/~filipp/REPAIR/F_Flyback_tst.html).*

*Something else I do when testing a LOPT is to supply it with a reduced B+ to enable scoping the HOT and measuring EHT (in situations where the monitor goes into HV shutdown). To reduce the B+, I use two light bulbs in series, one end to B+ supply, centre-tap to LOPT B+ connection, other end to ground. One bulb is 60 watts, the other is 100, so I can reverse the end leads and increase or decrease the B+ value used in testing.*

*At the outset, when I have power supply cycling but have confirmed there are no shorts from HOT-C to ground, I substitute a dummy load (60W bulb) for the LOPT where the B+ enters, to see if the power supply works with the LOPT out of the equation.*

*Overall, the LOPT tester can identify about 80% of LOPT failures. When trying to solve a puzzle, if someone offers information that is right 80% of the time, it's a lot better than having to guess 100% of the time, especially if the ante is the price of a LOPT and wasted, valuable time.*

*Michael Caplan does general electronic servicing in Ottawa, and added the following useful points in relation to TVs:*

*It's pretty straightforward to use, with the usual precautions of ensuring that the under-test unit power is off and any caps are discharged.*

*When testing an LOPT in circuit, it might be necessary to disconnect some of the LOPT terminals, and/or yoke plugs that could load it down and upset the readings. The tester will often not detect bad HV diodes in integrated split-diode LOPT units, nor shorts/arcing that is voltage dependent — but then no other passive tester does either.*

*I have found it useful for checking TV deflection yokes, both horizontal and vertical. A good yoke lights at least five and typically the full eight LEDs. However, many yokes have built-in parallel or series damping resistors, and these must be temporarily disconnected. Otherwise the reading will be low, even though the winding itself is fine.*

*The tester can be used for checking high-Q transformers such as those used in SMPS's. However, my experience has shown that it will not provide more than a two or three LED indication for good TV horizontal drive transformers. It can be used for these, however — to indicate shorts (no LEDs lit). On the other hand the ESR Meter (Dick Smith catalog number K-7204) can do much the same with these low resistance transformers.*

*Wayne Scicluna services TVs in Sydney, and is the technician who talked me into developing the tester in the first place. Here are his hints:*

## PARTS LIST

### Resistors

(All 5% 0.25W carbon)

R1,2,3,14 1M

R4 2.2M

R5,16 47k

R6,7,9, 1k

R17-24 1k

R8 270 ohms

R10,15 4.7k

R11 33k

R12 150k

R13 10k

### Capacitors

C1 100µF 16VW RB

electrolytic

C2,3,5,7 47nF MKT

C4 10nF MKT

C6 100pF disc ceramic

### Semiconductors

D1,2,3 1N4148 silicon

diode

IC1 LM393 dual

comparator

IC2 4015 dual 4-bit shift

register

LED1,2,3 Rectangular red LED

LED4,5 Rectangular yellow

LED Rectangular green

LED6,7,8 LED

Q1 BC328 PNP silicon

transistor

### Miscellaneous

PCB, 51 x 76mm; small (UB3)

plastic case, 130 x 68 x 41mm

(DSE H-2853); matching LOPT

tester front panel; battery holder

for 4 x AAA cells; battery snap

lead; power switch, push on/off;

one DIP8 IC socket, one DIP16; 4

x 19mm long 3mm tapped

spacers; 4 x black countersunk

3mm screws; 4 x plain 3mm

screws, approx 9mm long; 4 x

black countersunk self-tapping

screws; 1 x red, 1 x black 4mm

banana sockets; test leads with

4mm banana plugs; double-sided

foam adhesive tape; 4 x AAA cells

(not supplied with kit); connecting

wire, solder etc.



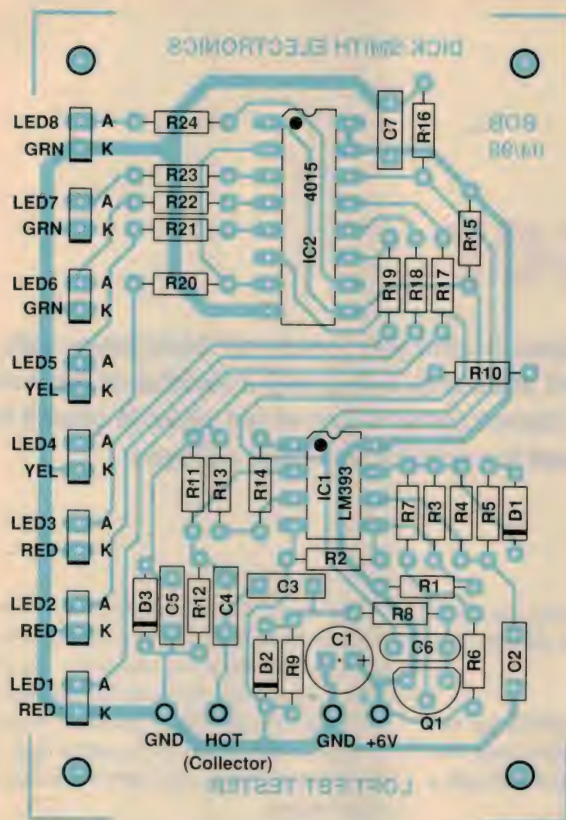
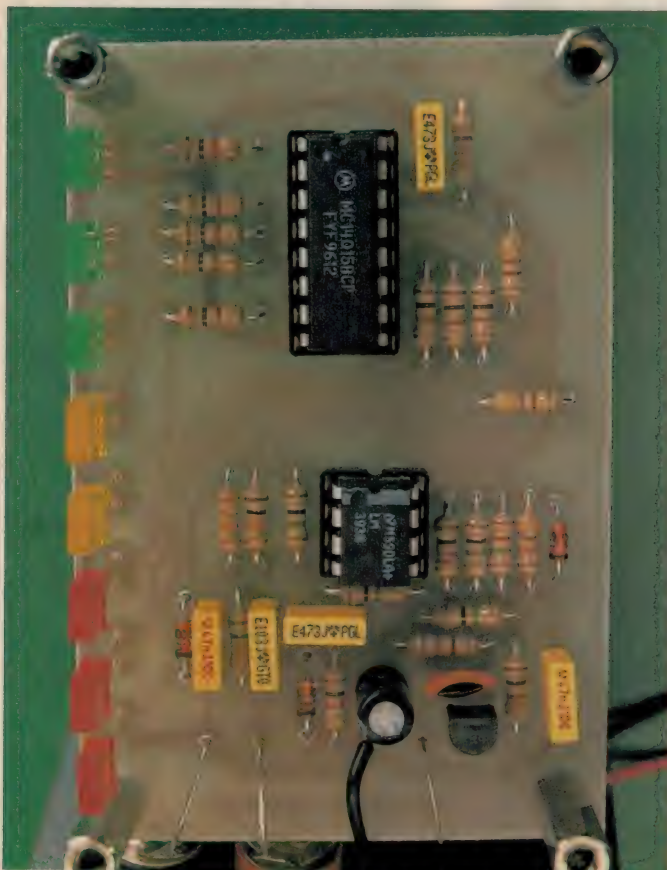


Fig.3: Use this PCB overlay and the facing photo as a guide in assembling the tester.



The assembled PCB, which supports virtually all of the circuitry.

If you've already checked for the more obvious leaky and shorted semiconductors and capacitors etc., and are still getting a low reading on the tester, there are some other traps to avoid.

You need to get a good connection with the test leads, because contact resistance can cause a low reading. The same applies to defective solder joints in the horizontal output stage, especially on the LOPT itself and HOT. In fact connecting the tester with clip leads, flexing the board and wiggling components is a good way to show up bad solder joints in this area.

Body conductivity can also cause a lower than normal reading if you're touching the test leads and your skin is damp. Low readings can also be caused by having the test leads reversed, i.e., connecting 'HOT Collector' to chassis, and by faults in an external voltage tripler.

## How to build it

Before soldering anything to the printed circuit board, hold it up to a bright light and examine the copper side carefully for fine track breaks and especially whiskers or bridges — particularly where tracks pass close to component solder pads.

Referring to the board overlay in Fig.3, begin installing the components, starting with the resistors and diodes and working your way up to the tall ones — but leaving the LEDs off the board for now. Take care with the orientation of the polarised components, including the IC sockets.

With everything but the LEDs installed on the PCB, once again illuminate it from the top, and check for and correct any solder bridges or other problems.

Now turn your attention to the front panel, mounting the banana sockets and the power switch in their respective holes.

Attach the tapped spacers to the corners of the board using plain 3mm screws, and solder long component lead offcuts to the 'GND', 'HOT Collector' and '+' solder pads, followed by the battery snap's black wire to the '-' pad. Then, without soldering them, poke the leads of all the LEDs through their respective holes in the board. Make sure the coloured LEDs are in their correct places, and that all the (long) anode and (short) cathode leads are correctly oriented as shown in Fig.3.

Using black countersunk 3mm screws, attach the front panel to the board assembly and place the whole thing face-down on a soft flat surface. Manoeuvre all of the LEDs into their cutouts in the front panel, and push each LED down slightly to ensure its face is level with the front of the panel. In the unlikely event that a LED won't fit, use a small file or similar to remove the excess powder coating inside the hole.

Now solder all the LEDs into place, then connect the test lead sockets and the closest terminal of the power switch to their respective wires from the board, and finally the red battery snap wire to the free switch contact.

Snip off the battery holder's PCB mounting pins, then install four 'AAA' cells into it. Connect the battery snap to the terminals, and switch the unit on. If everything's OK then the bottom red ('1') LED will illuminate, and shorting the test leads will cause it to go off.

An effective way to test the unit is to connect the test leads to the primary winding of a known good LOPT out of circuit, which should bring all eight LEDs on. Then thread a loop of solder around the ferrite core of the LOPT (simulating a single shorted turn), and the LED count should drop to 1-3 as the loop is closed.

If everything's OK, use double-sided adhesive tape to stick the battery holder into the bottom of the case, with the cells aligned in a 'north-south' direction for easiest access. All that remains to be done now is to screw the front panel into place and try out your tester on some LOPTs and their associated circuitry.

Finally, my sincere thanks to Larry Sabo, Michael Caplan, Wayne Scicluna and the guys at the Dick Smith Electronics Kit Department for their assistance in completing this project. I couldn't have done it without you! ♦



# Low Cost SMT Mini Light Chaser

**Here's another interesting little project designed to give you 'hands on' experience with modern surface-mount components and circuit assembly. Using only a handful of low-cost parts, it produces an attention-getting 'light chaser' using a ring of red LEDs. It should be very suitable as a 'learn while you build' project for schools and TAFE colleges.**

**by Jim Rowe**

**S**urface-mount technology (SMT) is steadily shrinking electronic components, and also changing the way they're handled and the way they're used to build up circuits. Undoubtedly SMT is the future of electronics, and that means that we all need to get experience with it. Even though SMT parts are basically designed for automated assembly, there's still going to be a need for manual servicing. As SMT parts gradually replace conventional leaded components, we're also going to have to use them for building our 'one off' projects manually...

But how do you get experience with SMT, on a small scale and as an individual? Most SMT components are sold on large reels, intended to be loaded into the 'pick and place' machines which place them onto the PC boards before the automated soldering operation. Very few suppliers make surface-mount parts available in small quantities, for the hobbyist or individual technician.

That's where this little project comes in. It's been deliberately designed to give experience in manual handling and assembly of SMT components, and Lazer Installations, whose principal Anthony Moutopoulos developed the project, is also able to supply complete kits for it direct — at a very low price. This should make it very attractive as a 'learn while you build' project, for schools and TAFE colleges as well as individuals.

Apart from the battery (a standard 9V, 216-type), all of the components fit on a tiny PC board measuring only 52mm square. It's very compact, but also quite impressive when it's operating — with a dot of light chasing around the ring of 10 tiny LEDs. As a project for beginners it's therefore quite satisfying, with an end product that will impress your friends and family.

Best of all, the quoted price for each kit is only \$8.00 plus \$2.00 for packing and postage within Australia. This should be well within

just about everyone's budget. Full details of the kit's availability are given in the parts list.

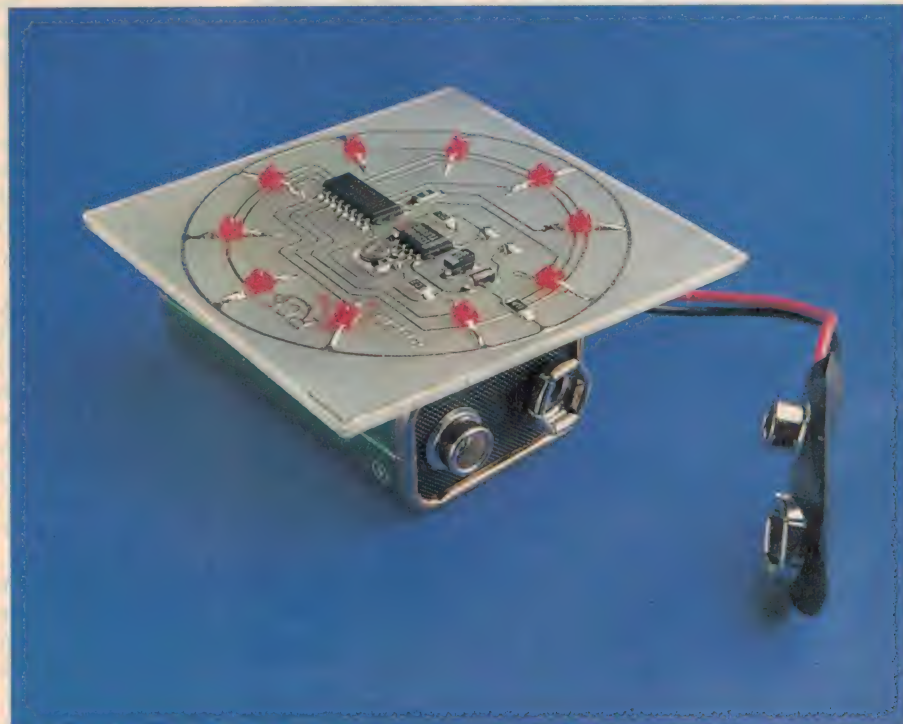
## How it works

As you can see from the schematic, the circuit is very straightforward, using only two standard ICs: a humble 555 timer chip and a 4017 Johnson decade counter.

The 555 is used here as an astable multivibrator or free-running oscillator, with its output frequency determined by fixed resistor R1, trimpot VR1 and capacitor C1. The trimpot therefore allows the oscillator frequency (and hence the 'chasing' speed) to be adjusted over a fairly wide range.

The output pulse from pin 3 of IC1 is fed through resistor R2 to the clock input of the 4017, which therefore counts the oscillator pulses. As a result, its 10 decoded outputs go 'high' in turn, and a high therefore effectively steps around from the 0 output (pin 3) to the 9 output (pin 1), and then begins at the 0 output again.

Our 10 LEDs are arranged in a circle, and each is connected between one of the 4017 outputs and the top of resistor R3, which forms a common current limiting resistor. So as each output goes high, its corresponding LED draws current and glows. As a result, we end up with a 'dot of light' jumping from



**All of the components fit on a small printed circuit board 52mm square, shown here a little larger than actual size.**



LED to LED — and thus seeming to chase around the circle of LEDs, at a speed controlled by VR1.

The whole circuit is powered from the 9V battery, with diode D1 connected in series with the positive input to prevent damage to anything if the battery is ever connected up the wrong way around.

One more point about the circuit itself. If you compare the circuit with the PCB overlay, which we'll be talking more about shortly, you'll find that there appears to be a fourth fixed resistor (R4). This is actually a 'zero ohm' resistor, also known as a 'packaged short circuit'. It's used as a crossover on our single-sided PCB, to allow the connection between pin 2 of IC2 to reach the '1' LED by crossing over the connection between pin 3 and the '0' LED.

In terms of circuit operation, then, the project is very straightforward. The only difference is that in this case, all of the components we're using are in very small surface mount packages. The larger of the two IC packages (IC2) measures only about 10mm long by 7mm wide (including 'gull-wing' leads), by less than 2mm high — and that's the largest component by far. The 555 chip measures only about 5 x 6mm by 1.5mm high, and the trimmer VR1 a mere 4 x 4.5 x 1.5mm. The fixed resistors are in the '1206' SMD package, measuring a mere 3.0 x 1.5mm in area and less than 1mm high, and the LEDs are only a whisker larger.

You will almost certainly need a magnifying glass or similar, to help you in building

this project! Other handy tools to have available are a good pair of tweezers and a few toothpicks — along with a soldering iron fitted with a very fine pointed chisel bit (clean and well tinned), and of course some very fine-gauge resin core solder.

## Construction

Firstly inspect the PCB board for any shorts or open circuits. Next make sure that you place all the components on a very clean and clear area, so you can use the tweezers to pick and place them on the board as required.

As an assembly hint, it is suggested that you use either 'BLU-TAK' or double sided sticky tape to anchor the PCB on the assembly surface, while you're adding the components.

Be very careful to identify the various components, because they're so small. The ICs and trimpot are quite easy to identify, with their larger packages and markings, and/or distinctive shape. The LEDs are also fairly easy to identify, with their small domed red packages. If you look carefully, though, you'll find that the 'dome' is a little closer to one end than the other — i.e., there's a wider 'flat' at one end. This is how you identify the LED's anode and cathode: the end with the wider flat is the anode, while the end nearer the dome is the cathode.

The series diode D1 is in a tiny cylindrical package, about 3mm long and a little over 1mm in diameter — but note that at one end, there's a small ring of light colouring which identifies the cathode end.

Like the diode, tantalum capacitor C1 also

must be connected in circuit the correct way around. In this case it has a band of white which identifies the positive end, along with the marking 'C105'.

Note that the 555 (IC1) package also has a white bar along one end, which identifies the end closest to pin 1. This is the guide for orientating this IC correctly. The 4017 (IC2) is a little trickier, and you really have to use your magnifying glass to examine its profile, at one end or the other. It has a 'chamfer' along only one of the longer sides, and this is the side with pins 1-8. Once you know this you should be able to orientate it correctly.

The PCB overlay diagram shows which way around C1, D1, IC1 and IC2 are fitted to the board. Note that all of the LEDs are fitted with their anodes ('wider flat' ends) towards the centre of the board, and their cathodes ('dome' ends) connecting to the outermost 'ring' conductor.

Since the resistors are all in the same '1206' packages, how can you tell them apart? It's easy when you know the coding used in their markings, which is basically the same as the colour code used for conventional leaded resistors, only in digits. Hence the 10k resistor (R1) is coded '103', the 1k resistor (R2) is coded '102' and the 470Ω resistor (R3) is marked '471'. The zero-ohm resistor (R4) is simply marked '0'.

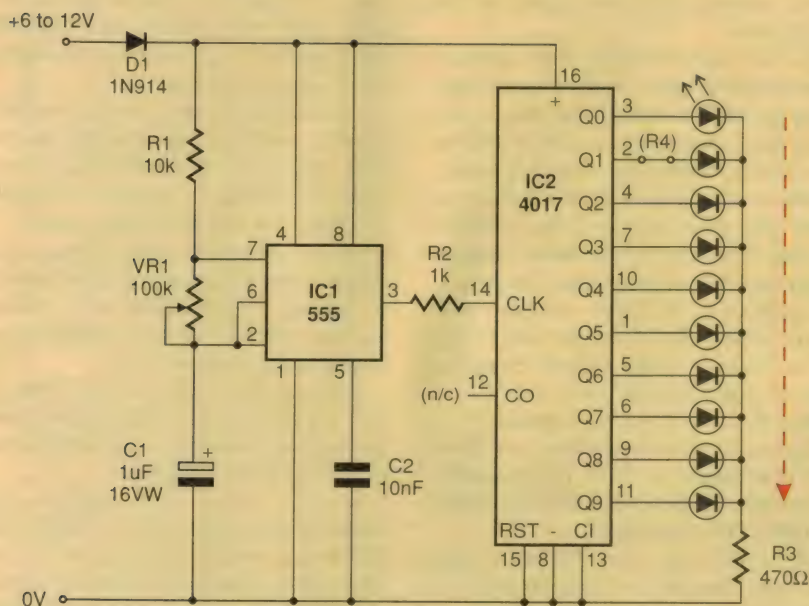
The 10nF capacitor (C2) is also in a '1206' package, but in this case there are no markings and the case is a caramel colour — apart from the tinned electrodes at each end.

## The actual assembly

With the parts all identified, the next step is to fit them to the board. This is a bit fiddly, because SMT parts are really not intended for manual assembly. But if you work carefully and follow the procedure to be described, it shouldn't present any problems.

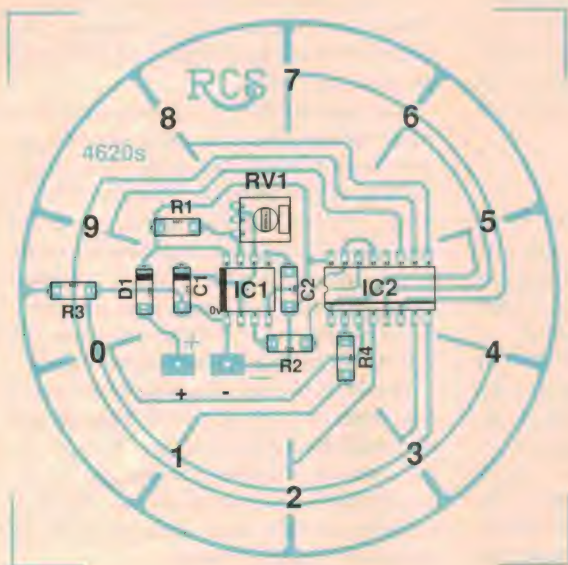
Before attempting to solder each part to the board, pre-tin each of the corresponding board pads if necessary, using your fine-pointed iron and very fine gauge solder (definitely not the kind you use for soldering gutters!). This should leave a very thin 'cushion' of solder on each pad. Then move the component into position, with its ends or leads sitting on the pads, and hold it in place — using the end of a toothpick, or a fine pair of tweezers if you prefer. Finally, re-apply the tip of the soldering iron so that it contacts both one end of the component and its solder 'cushion', whereupon the solder should reflow and fuse the two together.

Initially, you only need to solder one end (the 'easy' end) of each of the smaller components in this way, to attach them to the board. The main thing is to ensure that the component doesn't move out of its correct position, or stand on end like a 'tombstone', while the solder is still in the liquid state. Of

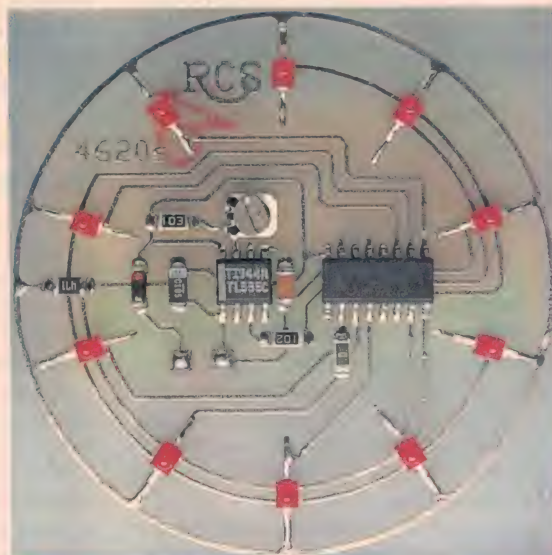


The circuit itself is very straightforward, with a 555 clock oscillator driving a 4017 counter, whose outputs drive the 10 LEDs in sequence.





*You shouldn't have any trouble building the mini light chaser, if you use this parts overlay (left) and close-up photo as a guide. The text explains how to orientate the LEDs.*



## PARTS LIST

### Resistors

R1	10k ('103')
R2	1k ('102')
R3	470Ω ('471')
R4	Zero ohm link ('0')
VR1	100k trimpot ('104')

### Capacitors

C1	1μF 16VW tantalum ('C105')
C2	10nF ceramic (caramel body, or 'C103')

### Semiconductors

D1	1N914 diode (cylindrical glass body)
IC1	555 timer ('TL555C')
IC2	4017 decade counter ('HEF4017B1')
LED1-10	Red LED, SMT package

### Miscellaneous

PCB, 52 x 52mm, RCS code 4620s; 9V battery snap connector with leads; 9V 216-type battery (not included in kit).

Note that complete kits (apart from the 9V battery) for this project are available from Lazer Installations, of PO Box 13, Little Bay 2036; phone (02) 9311 1500, or (018) 231 861. The cost is \$8.00 per kit, plus \$2.00 for packing and postage anywhere in Australia. Payment can be by cheque, cash or money order; however credit card orders can't be accepted.

course you should also prevent it from moving until the solder solidifies, to ensure a good joint. Don't exert too much pressure on the component, though — if it ends up stressed, it may very well fail.

This procedure should be followed with all of the smaller parts, and is only modified slightly for the ICs. With the latter you can solder say pin 1 first, then check that all of the remaining pins are positioned squarely over their respective pads. Then you can solder the remaining pins on the same side, if all seems OK. This will anchor the chip to the board quite firmly, allowing you to come back and solder the remaining pins after you've soldered the 'other ends' of the smaller parts.

This 'one end of all parts first' approach has the advantage that you don't have to keep turning the PCB around all the time. It also ensures that each part can cool down from the first soldering, before it gets heated up again...

Perhaps I should stress again here that you should take great care to fit the polarised parts (the ICs, diode D1, tantalum capacitor C1 and the LEDs) to the board with the correct orientation, BEFORE soldering even one end to the board. These parts can be very hard to remove again without damaging them, if you discover later that you've installed them the wrong way around.

**Resoldering or 'reworking' of these SMT components is NOT recommended — so your motto should be 'MAKE SURE BEFORE YOU SOLDER'.**

Take special care when you're soldering the IC pins, because the chip can easily be damaged if you leave the iron on too long and

it's overheated. After soldering these pins (which are spaced at 0.05" — half the spacing of conventional DIP pins), examine them very closely with a magnifying glass to ensure that you haven't left any solder bridges.

Finally, solder the red and black wires from the 9V battery snap connector to the PCB, with the red wire going to the '+' pad and the black wire to the '-' pad.

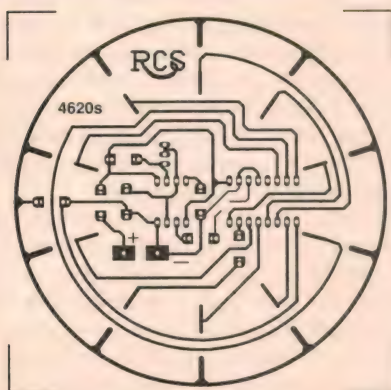
## Trying it out

Your mini light chaser should now be complete, and all that should remain is to check that it works. If you set the trimpot to its mid position and connect the battery to the snap lead, you should be rewarded by having the LEDs glow briefly in turn, so that dot of red light appears to 'run around the board', in an anticlockwise direction.

You should be able to slow down the speed of rotation by turning VR1 anticlockwise, until it becomes quite obvious that the LEDs are turning on and then off again in sequence. On the other hand turning VR1 clockwise should allow you to speed up the rotation, until it reaches a situation where it's so fast that all LEDs appear to be 'blinking' together. (This is probably due to persistence of your eye's response.)

That's all there is to this novel little project. It's all good fun, and of course you're getting good experience with surface-mount technology at the same time...

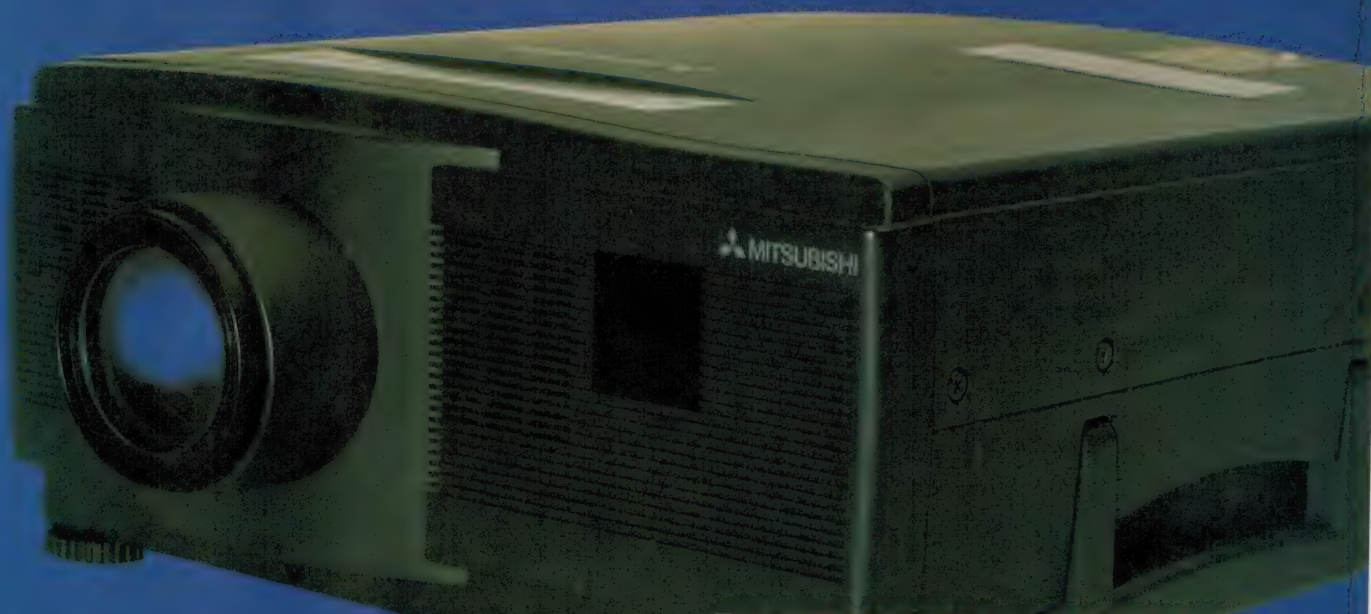
By the way, kit supplier Lazer Installations is also able to supply SMT Starter Kits, containing 50 of each of 18 different SMT resistor or capacitor values (i.e., a total of 900 parts in each kit). The Resistor Starter Kit sells for \$35, and the Capacitor Starter Kit for \$85 — plus \$3.00 in each case to cover packing and postage. The address information is shown in the parts list. ♦



*At left is the artwork for the chaser PCB, shown actual size for those who want to make their own.*



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# \$10 Wonders

## 14 — Mailbox Monitor

*It's raining outside. You are waiting for a letter and you think the postman drove past a few minutes ago, but you're not sure. Is it worth getting wet just to find out that there's nothing there? If you're like me, then the answer is NO! Not if you can build a little circuit for less than \$10, that'll do it for you...*

**O**ur mailbox is out of sight of the house and when the postman comes, he swirls his bike around so fast that we are never sure if he has deposited any mail there or not. And of course there are many days when, for one reason or another, we don't hear him at all. Who wants to make the long trek to the mailbox and find nothing inside? This circuit tells us when there is something there.

Of course, it may still turn out to be junk mail — but so far, we have not been able to invent a device for less than \$10 that actually reads the mail!

### How it works

We toyed with the idea of using some kind of mechanical trigger to detect the mail delivery, but decided that it would be sure to get snagged up in the letters and pamphlets, and cause the postman intolerable stress. So we decided on using a light sensor. The first stage (in Fig.1) is the detector, which consists of a photo-transistor with built-in amplifier, sold under the type number MEL12. This has a transparent plastic body, the upper surface being curved for focusing light on to the transistor. The usual three

wires project below, but because this is a photo transistor, we do not need to use the base connection.

Instead of feeding a current to the base to turn the transistor on, we simply shine a light on it. The light energy generates electron-hole pairs and the transistor action then proceeds as usual. The more light, the more electron-hole pairs and the larger the current that can flow through the collector. The collector current flows through R1, producing a voltage drop across it. The more light, the bigger the voltage drop, and the lower the potential at the capacitor C1.

The idea of this circuit is that it monitors the amount of light entering the mailbox through the slot. When a letter is delivered, there is a brief drop in the amount of light entering the box, and this triggers the monitor.

There is also a drop, but not as brief, if the Sun goes behind a cloud, or when evening approaches. The second stage of the circuit, based on an operational amplifier (IC1), distinguishes between rapid and slow changes of light level. IC1 is wired as a differentiator, with its output is proportional to the rate of change of the voltage on C1. If the light level changes slowly the output of the op-amp stays more-or-less constant at 5V or more.

If the light level decreases quickly, the op-amp swings sharply toward zero volts. If the light level increases rapidly the output swings sharply upward. It is the sudden fall in output when a shadow passes across Q1 that we use to trigger the circuit.

Adjusting VR1 sets the sensitivity of this part of the circuit. If this is set so that the voltage at pin 3 of the op-amp is around 7V, the circuit will respond to rapid changes of light level, but ignores slow changes. If we set the voltage lower, the circuit becomes very sensitive and even a slow change of light level will trigger it. If we increase the voltage



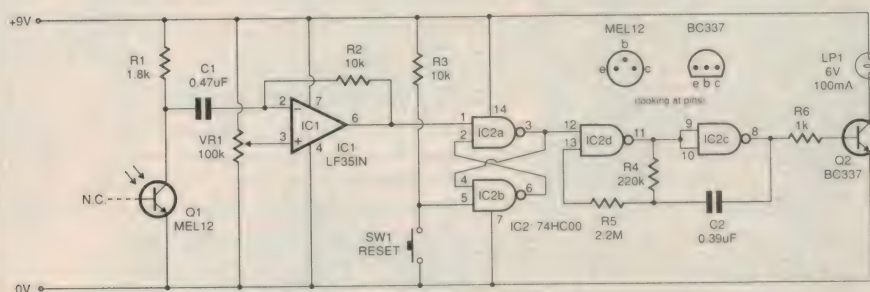
*Shown here connected to a small 6V lamp, the Mailbox Monitor watches the slot on your letterbox with the phototransistor just visible in the upper lefthand corner of the board.*

above 7V, it requires a very rapid change to trigger it, and may cease to trigger at all.

The third stage is a flip-flop, built from two cross-connected NAND gates (IC2a/b). The two inputs to this circuit, from IC1 and from SW1 are normally at logic high (over 4.5V, usually almost 9V). Pressing SW1 resets the flip-flop and the output at pin 3 goes to logic low (less than 4.5V, usually close to 0V). The output stays low until the output from the op-amp falls below 4.5V. Then the output goes high and stays high until SW1 is pressed again.

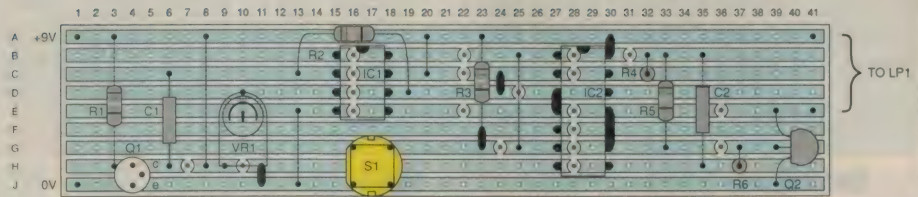
The fourth stage is an oscillator, running at about 0.5Hz. This is a standard CMOS logic gate oscillator (or astable), except that we can stop or start it by setting or resetting the flip-flop. With the flip-flop set, its output is

*Op-amp IC1 detects a sudden change in light level, and sets the flip-flop based around IC2a and b. When triggered, the oscillator (U2c and d) flashes the lamp at around 0.5Hz to let you know that your letter has arrived.*





*You can make good use of solder blobs to save inserting wire links, but don't forget to install the four long links on the board. Bend the base lead of the phototransistor up and out of the way of the board and other components, as it isn't used in this circuit.*



low, which means that the output of IC2d is latched at a high level and the oscillations stop, with the output of IC2c in the low state.

When a shadow interrupts the light to Q1, however, the op-amp output drops for a moment, but for long enough to trigger the flip-flop. The output of the flip-flop goes high, enabling the oscillator, which starts sending pulses off to Q2. This flashes the lamp LP1 alternately on and off, and the flashing continues until the reset button is pressed.

## Visual alert

This circuit can drive various kinds of indicator — which one you choose depends much on local circumstances. If the mailbox is out of sight but not too far from the house, LP1 can be located in sight of the house or even indoors, at the end of a long lead. In the latter case, you could replace LP1 with a LED (with a 470Ω resistor in series with it).

A typical lamp takes around 0.5A when overrun by being powered from 9V. The transistor specified can, in theory, switch 0.7A. But lamps take a larger current when the filament is cold, so surges greater than 0.7A may be expected. It is safer to use a more powerful transistor with this type of lamp, such as a BD139, which can handle 1A.

Over-running the lamp gives a brilliant warning and the full 9V does not appear across it, but if you would rather not have to replace the lamp too often, run the circuit on 6V. If it won't annoy the neighbours, you could use an audible warning device instead of (or as well as) a lamp. There are many types of electronic buzzer and siren to be had. It might startle the postman though!

## Construction

The circuit has many of its connections made by leaving the copper strips on the board uncut beneath the ICs, and also by joining adjacent strips with blobs of solder (Fig.2). This simplifies the wiring a lot, but check carefully that you get these connections right.

It is best to assemble the circuit by stages and test it as each stage is added. You need a reasonably well-lit bench area. First assemble the sensing circuit, which includes everything from column 1 to 20. To test it, apply the 9V power supply, then adjust VR1 until the voltage at IC1 pin 3 is about 6V.

Now measure the voltage at pin 6. It should be high, perhaps in the region of 8V and should go low when you shade Q1.

Sweep your hand across fairly quickly to cover Q1, and depending on the setting of VR1, you may find that the needle on your meter flicks only a fraction of a volt in the downward direction, and only for an instant. This is quite in order. The output of IC1 actually dips below 4.5V for a fraction of a second, but the change is too quick for the needle to follow. It may also be too quick for a digital meter to follow at all, so an analog (old fashioned moving-coil) meter is preferable for testing, or use an oscilloscope.

If all is well, remove IC1 from its socket so as to make it easier to test the later stages.

Next, assemble the flip-flop and oscillator — that is, everything as far as column 35 of the board. Note that several of the socket pins are joined by solder and that the strip is NOT cut at D28. Push a thin wire into the socket of IC1 at pin 6 and connect this temporarily to the 9V rail. (Or you can clip a connecting lead between the bare wire of R2 and the 9V rail). This holds IC2 pin 1 high, and you can now measure the voltage

at pin 3 of IC2. If this is low, the flip-flop is reset and no oscillations should appear at pin 8, which will have a low output.

Temporarily move the wire connected to pin 6 of IC1's IC socket to the 0V rail and back to 9V. This will set the flip-flop, pin 3 will go high and oscillations at about 0.5Hz appear at pin 8. Reset the flip-flop by pressing SW1. Both pin 3 and pin 8 should go low.

Finally add R6 and Q2 and connect a lamp between the output pins. Repeating the test above should now turn the lamp off when the flip-flop is reset and make it flash when it is set. Finally replace IC1 in its socket and test the completed circuit. Just passing a finger between a bench lamp and Q1 should be enough to trigger it. Adjust VR1 so that it triggers when you shade Q1 quickly, but there is no effect if you slowly bring your hand across and down over Q1 to block out the light entirely. We find this works best if the voltage at IC1 pin 3 is close to 7V.

It only remains to mount the device in your mailbox. Possibly the circuit should be enclosed in a plastic case mounted on the outside of the box, with the sensor inside the box.

One of the problems with any light-triggered circuit is that local conditions vary tremendously. If your mailbox is situated under a dense tree, light levels will be lower than in a box in full sun. You may need to alter component values, in particular to increase R1 to boost voltage changes. You may find that varying C1 and/or R1 also helps to make it work better. Also, if you prefer more rapid flashing, reduce the value of C2. Incidentally, this circuit doesn't work at night — but then neither does the postman!

## Other uses

Basically this is a device for detecting a sudden, though maybe brief drop in light level, so it can be used for any situation in which this is meaningful. You can use it as an intruder detector, or to let you know when pussy comes in through the cat-door; or when the toddler wanders out of the family room.

Perhaps its most esoteric use is in home brewing. Toward the end of fermentation, the bubbles come exceedingly slowly. Watching for them can be quite a bore. So just position the sensor behind the bulb in the trap; reset the circuit and go. If a bubble pops up while you are away, the lamp will be flashing on your return. If it is not flashing, the brew is ready for bottling. Cheers! ♦

## Parts List

### Resistors

(1/4W metal film, 5% tolerance)

R1	1.8k
R2, R3	10k
R4	220k
R5	2.2M
R6	1k
VR1	100k miniature horizontal trimpot

### Capacitors

C1	0.47uF MKT or greencap
C2	0.39uF MKT or greencap

### Semiconductors

IC1	LF351N biFET op-amp, or similar (TL081C)
IC2	74HC00 CMOS quad 2-input NAND gates
Q1	MEL12 phototransistor
Q2	BC337 (or BD139) NPN power transistor

### Miscellaneous

SW1	single pole momentary push-on switch
LP1	6-9V lamp, 100-200mA
Matrix board	25mm x 106mm (9 strips by 41 holes); 4 x 1mm terminal pins; 8-pin IC socket; 14-pin IC socket; PP3 battery clip.



# JAYCAR ELECTRONICS

# AMAZING AUGUST SALE

Prices valid until  
August 31st.

All prices in Australian Dollars - New Zealand customers please ask for New Zealand prices.

## DOOR/WINDOW ENTRY CHIME

**NEW in 98**

This unit will chime when a door or window is opened. The magnet assembly fixes to the door and will work on either side of the main unit which fixes to the frame. Requires a 9V battery to operate. Ideal for shops, offices, surgeries, restaurants etc. Cat. LA-5168

**\$14.95**

## INVERTER AUGUST!!!

Buy this month and save \$\$\$ on 12 - 240V inverters.

**140W** Cat. MI-5036

**200W** Cat. MI-5038



Normally \$109.95  
August **\$99.95**

Normally \$169.50  
August **\$149.50**

**300W** Cat. MI-5042

**500W** Cat. MI-5052



Normally \$249.50  
August **\$219.50**

Normally \$399.00  
August **\$359.00**

## BATTERY BACKUP SIREN

New small size, 80(L) x 70(W) x 92(H)mm.  
Sound output 125dB. Cat. LA-8910

Save \$9.95 Was \$49.95  
August **\$40**



**BUY A CAR ALARM IN AUGUST,  
AND YOU CAN BUY A  
4-DOOR POWER LOCK KIT  
FOR ONLY \$49** Cat. LR-8830 **Save \$20**

## CAR ALARMS

**LEGEND with Siren** Cat. LA-8912 **\$169.50**

**LEGEND with Back-up battery Siren** LA-8914 **\$189.50**

**EQUATOR + Siren** Cat. LA-8940 **\$219.00**

**EQUATOR + Back-up battery Siren** LA-8950 **\$239.00**



## CAR BATTERY GUARD

**NEW in 98**



This guard prevents the car battery from running down by switching off automatically when the battery falls below 11.2 volts. Supplied with cigarette lighter plug and socket on lead. Simply connect the device being used in line. Max. current is 10A.

Cat. AA-3092 **Only \$29.95**

## CHEAP MULTIMETER!!!

Ideal spare, one for the glove box, or garage. 2K ohm / volt. Cat. QM-1001

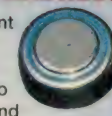
Save \$4  
Was \$16.95  
August **\$12.95**



## BUTTON BATTERY MADNESS

Stock up! Our suppliers sent us the wrong battery, so we're clearing them out. Type G10 Silver Oxide. Also known as RS1130W, 389 and WL10. Size is 11(od) x 3(H)mm. 60mA.

Cat. SB-2508 **Save \$24**  
Normally \$1.60ea.  
August **10 for \$5**



## vifa D25 DOME TWEETER



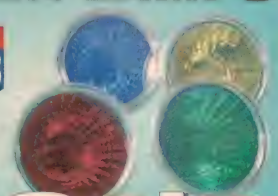
Our best tweeter. See 98 Cat. page 34 for full details. Cat. CT-2020

**Cat. Price**  
**\$69.50**  
**August**  
**\$59.50**  
**Save \$10**

**BUY 10  
LESS 10%**

## COLOURED 12V HALOGEN LAMPS

Now in 4 colours. Ideal for house, shop, display and garden lighting. Large size - 51mm dia., 38° wide angle.



**RED** SL-2741  
**GREEN** SL-2742  
**BLUE** SL-2743  
**YELLOW** SL-2744

**Only \$9.95ea**

## PIR ENTRY ANNOUNCEMENT ALARM/CHIME

**NEW in 98**

It's an alarm and a chime. The alarm protects an area of about 8 metres and has a 15 second delay with a sound output of 90 dB. It's also a chime to advise of incoming. Requires a 9V battery. See 98 Cat. page 81 for full details.

Cat. LA-5178 **\$34.95**



## WHAT A FLOP! Why Take The Risk? RADIATION PHONE CASES

No one seems terribly interested in the fact that mobile phones may fry your brains! Now you don't have any excuses!

**Only \$5 each.**

<b>Microtac</b>	Cat. HC-6920
<b>Motorola 8200,8400</b>	Cat. HC-6922
<b>Motorola Flare</b>	Cat. HC-6924
<b>Motorola 8500,8700</b>	Cat. HC-6926
<b>Nokia 2110</b>	Cat. HC-6930
<b>Nokia 1610</b>	Cat. HC-6932
<b>Nokia 8110</b>	Cat. HC-6934
<b>Nokia 3110</b>	Cat. HC-6936
<b>Ericsson 318/388</b>	Cat. HC-6938
<b>Ericsson 738/788</b>	Cat. HC-6940



## CRAZY PRICES ON SPEAKER GRILLS

Black grills, supplied with mounting screws, lugs etc.

SIZE	CAT NO	WAS	NOW	SAVE
6-6.5"	AX-3518	\$8.95	\$5.95	\$3
8"	AX-3520	\$8.95	\$5.95	\$3
10"	AX-3522	\$11.95	\$7.95	\$4
12"	AX-3524	\$13.95	\$8.95	\$5
15"	AX-3526	\$16.95	\$10.95	\$6



## Jaytech 32 RANGE DMM

•Holster included •Large display •Transistor Test •Buzzer •Diode. See 98 Cat. page 21 for full details. Cat. QM-1300

**Was \$57.95**  
**Save \$7.95**  
**August \$50**





# OVERNIGHT DELIVERY

## MAIL ORDER CORNER

Only available by ordering from our Mail Order Department direct.  
Call 1800 022 888 & have your credit card handy! P & P charge \$1.00

- RJ45 8/8 lead, plug to plug, 750mm long. Round grey. Qty 105 Cat DD-1000 **\$4ea**
- RJ45 8/8 lead, plug to plug, 2m long. Flat cable. Qty 70 Cat DD-1001 **\$5ea**
- RJ45 8/8 lead, plug to plug, 1.5m long. Round cable. Qty 97 Cat DD-1002 **\$6ea**
- RJ45 8/8 lead, plug to plug, 3m long. Round cable. Qty 25 Cat DD-1003 **\$8ea**
- RJ45 8/8 lead, plug to plug, 5m long. Round cable. Qty 30 Cat DD-1004 **\$10ea**
- RJ12 6/6 lead, plug to plug, 3m long. Curly cord lead. Grey colour. Qty 40 Cat DD-1005 **\$2ea**
- RJ12 6/6 lead, plug to plug, 3m Curly cord lead. Ivory colour. Qty 200 Cat DD-1006 **\$2ea**
- D9 male to D9 female lead, female is IDC, male is soldered, 270mm long. Flat cable. Qty 580 Cat DD-1007 **\$2.50ea or 10 for \$15**
- D25 male to D25 female lead, female is soldered, male is IDC, 270mm long. Flat cable. Qty 285 Cat DD-1008 **\$2.50ea or 10 for \$15**
- D25 male to D25 female lead, RS232 Pins connected 2,3,6,7,8,9,10,20,21,23, 24,25 Grey round cable 1m long. Qty 200 Cat DD-1009 **\$3ea or 10 for \$20**
- D25 male to D25 female computer lead, RS232 Pins connected 1,2,3,4,5, 7,11,18,20,21,23,24,25 grey round cable 1m long. Qty 200 Cat DD-1010 **\$3ea or 10 for \$20**
- Capacitor 0.1uf 250v blue Size 13(h)x6(w)x L & pin spacing 20mm. Qty 442 Cat DD-1010 **10 for \$2**
- 2 meg sim module. Has 9XD41256L-10 SMD chips on PCB. Qty 228 Cat DD-1011 **\$5ea or 10 for \$25**
- Relay 110VAC 4PDT cradle. Japanese. Contacts.1.5a/120v, 0.8a/240v. Qty 180 Cat DD-1012 **\$3ea or 10 for \$20**
- Through panel DIL switch. 4 pole ganged. RS Components 304-791. Qty 390 Cat DD-1013 **\$3ea or 10 for \$20**
- IEC Belling Lee mains filter. #12133c/s. Qty 56 Cat DD-1014 **\$7.50ea**
- Switch DPDT centre off. Momentary & lock with Screw connector. Qty 66 Cat DD-1015 **\$2.50ea or 10 for \$18**
- Can capacitor. Roe, West Germany 15,000uf 40v. Qty 78 Cat DD-1016 **\$5ea or 10 for \$30**
- Relay base. Suits power relay SY4065. Fujitsu brand. Qty 120 Cat DD-1018 **\$2ea or 10 for \$12**

Limited quantities available on these products. Be Quick!!!

## SAVE 30% ON CAR POWER CABLE

This cable is not quite up to full 4G and 8G specs. Its slightly smaller, but will still do the job perfectly in 99% of installations. Your chance to save !!

## 8GA POWER CABLE

Normally \$2.95 mt. / \$220 100mt. roll.

Now \$1.95 mt. / \$170 100 mt. roll.

RED Cat. WH-3070

BLACK Cat. WH-3072

## 4GA POWER CABLE

Normally \$7.95 mt. / \$325 50mt. roll.

Now \$5.50 mt. / \$225 50 mt. roll.

RED Cat. WH-3074

BLACK Cat. WH-3076

## DWELL TACH DMM

- RPM X 1, X10 •Dwell Angle
- Resistance •DC Volts
- Holster included.

See 98 Cat. page 25.

**Buy for \$79.95**

Cat. QM-1440

**Get this free**

CAR IN/OUT THERMOMETER

Cat. XC-0130

**Worth \$21.95**

**TURN YOUR SURPLUS STOCK INTO CASH!**  
Call Bruce Routley on 02 9743 5222

## SOLDERLESS CONNECTORS SLASHED

### INSULATED PIGGY BACK

Spade width 6.4mm

Packet of 50 **Was \$6.95**

**Now \$8.95 Save \$2.00**

Cat. PT-4511

### INSULATED BLADE

Blade width 2.8mm

Packet 100 **Was \$9.95**

**Now \$5.95 Save \$4.00**

Cat. PT-4517

### INSULATED LUG

OD 5.7mm. ID 3.8mm.

Packet 100 **Was \$9.95**

**Now \$5.95 Save \$4.00**

Cat. PT-4524

### INSULATED EYE

OD 8mm. ID 5.3mm.

Packet 100 **Was \$9.95**

**Now \$5.95 Save \$4.00**

Cat. PT-4515

### INSULATED MALE SPADE

Spade width 4.8mm

Packet 100 **Was \$9.95**

**Now \$5.95 Save \$4.00**

Cat. PT-4519

## SAVE ON SILVER RACK PANELS

Brushed anodised panels in silver (natural) finish.

SIZE	CAT NO	WAS	NOW	SAVE
44mm	HB-5431	\$11.50	\$8.95	\$2.55
88mm	HB-5433	\$18.95	\$13.95	\$5.00
132mm	HB-5435	\$24.50	\$18.50	\$6.00

Special prices for silver only

## OFFSET RATCHET SPANNER SET

No more skinned knuckles! 5 double ended tools. 5.5, 6.0, 7.0, 8.0, 10.0, 11.0, 12.0, 13.0, 14.0, 17.0mm. Cat. TD-2112

**Were \$29.95**

**Now \$24.95**

**Save \$5**

## REAR/WALL MOUNT SPEAKERS

Ideal for surround sound rear speakers, or just stereo wall mount. Handles 30WRMS, 2 way with dome tweeter and 5.2" woofer. Grey in colour

**Save \$26**

**Cat. Price \$165 Pr**

**August \$139Pr**

## CENTRE SPEAKER

Includes 2 x 5.2" woofers and dome tweeter. Matches the rear speakers. Grey in colour. 60WRMS power handling. See 98 Cat.

page 44 for full details.

Cat. CS-2515

**Save \$24**  
**Was \$149**

**August \$125**

## NEW KIT - NEW KIT

### FRONT END KIT FOR PC SOUND CARDS



REFER: EA AUGUST 1998  
Don't just use your soundcard for playing games - turn it into an audio analyser instead! Audio analyser and monitoring software is readily available over the internet & bulletin boards to turn your PC into a spectrum analyser, CRO or loudspeaker analyser. Kit includes case, PCB plus all electronic components.  
Cat. KA-1811

**\$28.95**

## THE LATEST BOOKS

BB-7057  
BB-7442  
BB-7056  
BB-7444  
BB-7441  
BB-7440  
BB-7443

Simple Sensor Terminal Block Projects  
MS Excel 97 Explained  
Introduction to PIC Microcontrollers  
Web Pages Using Microsoft Office 97  
Trouble Shooting your PC  
MS Word 97 Explained  
Explaining Microsoft Money 97

**\$15.95**  
**\$21.95**  
**\$19.95**  
**\$21.95**  
**\$21.95**  
**\$21.95**  
**\$19.95**



**BUY 5 OF A PRODUCT WORTH \$100 OR MORE LESS 10%**

MAIL ORDER - FREECALL FOR PHONE ORDERS 1800 022 888 / NEW ZEALAND 0800 4529 227



## CCD CAMERA & MONITOR SURVEILLANCE DEALS

### DEAL 1 Save \$33.40

- 5.5" 2 channel b & w monitor Cat. QM-3430 **\$199.50**
- CCD camera in metal case Cat. QC-3470 **\$145.00**
- Mains power supply for monitor Cat. MP-3033 **\$32.95**
- 10 metre camera signal lead Cat. WA-1110 **\$14.95**

**\$392.40**  
**only \$359**

### DEAL 3 Save \$57

- 10" 4 channel b & w monitor Cat. QM-3435 **\$399.50**
- CCD camera in metal case Cat. QC-3470 **\$145.00**
- Mains power supply for camera Cat. MP-3002 **\$11.50**

**\$556.00**  
**only \$499**

### DEAL 2 Save \$33.35

- 5.5" 2 channel b & w monitor Cat. QM-3430 **\$199.50**
- Pinhole CCD board camera Cat. QC-3461 **\$125.00**
- Audio PC board for camera Cat. QC-3468 **\$19.95**
- Mains power supply for monitor Cat. MP-3033 **\$32.95**
- 10 metre camera signal lead Cat. WA-1112 **\$14.95**

**\$392.35**  
**only \$359**

### DEAL 4 Save \$56.95

- 10" 4 channel b & w monitor Cat. QM-3435 **\$399.50**
- Pinhole CCD board camera Cat. QC-3461 **\$125.00**
- Audio PC board for camera Cat. QC-3468 **\$19.95**
- Mains power supply for camera Cat. MP-3002 **\$11.50**

**\$555.95**  
**only \$499**

For full details on these, see our 1998 catalogue page 201. Please note: The 10" monitor has different features to what is listed in the catalogue. It has one way audio from camera only, it has RCA sockets for audio input and BNC sockets for video input (not Mini Din). There are separate terminals for the alarm, which can be connected to an alarm panel or control VCR.

### RJ 45 8/8 PLUGS

Limited quantity.  
Not Austel approved.  
Approved ones sell for \$1.05ea. These are only 69.5 cents each.  
Cat. PP-1436  
**Pkt. 10 \$6.95**

### CRAZY PRICES ON WIRE WOUND POTS

Philips 3 watt wire wound pots.

**Normally \$4.95ea**  
**VALVE 2.2Ω** Can be mixed  
Cat. RP-3970  
**VALVE 3.3Ω** mixed  
Cat. RP-3971  
**Buy 5 for \$10**

## SLASH THE COST OF LONG DISTANCE CALLS BY USING YOUR PC & INTERNET CONNECTION! INTERNET PHONE

Call a regular telephone anywhere in the world using your local ISP. Suitable software such as Netscape Communicator or Microsoft Net Meeting, required. (not included). See last months advert for full details.

Cat. XC-5100 **\$24.95**

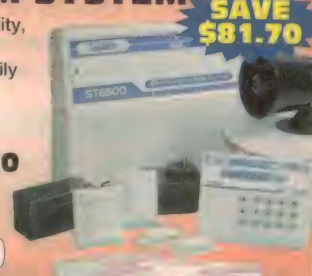


## 6500 8 SECTOR BUDGET ALARM SYSTEM

The economical way to buy a top quality, low priced system. Includes all the components to give you and your family peace of mind. See page 77 of '98 Catalogue for full details.  
Cat. LA-5444

**Normally pay \$360.70**

**Now Only \$279**



## VULKAN

The fuel is standard butane gas, which is stored in the translucent handle. Gas is ignited using a piezo electric spark. Vulkan Tools are made in Ireland.

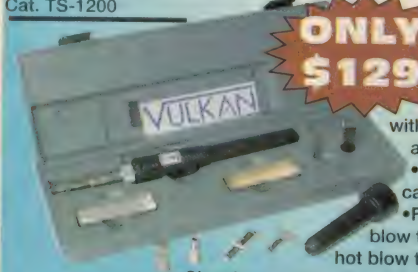
### PROFESSIONAL

- FEATURES:
- Piezo electric ignition
  - Adjustable heat output
  - Equivalent of 20 to 135 watts
  - Gas refills last up to 180 minutes
  - Translucent gas tank for visible fill level
  - Temperature range 400°C to 1,200°C
  - Includes the tool, cap and 2.4mm chisel tip.



**ONLY \$89**

**FREE STAND AND FLAME TIP VALUE \$21.90 WITH TS-1200 PURCHASE**



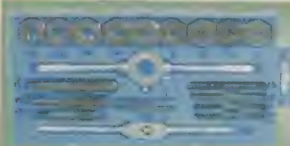
**ONLY \$129**

### PROFESSIONAL TOOL KIT

- Kit includes the same tool as the TS-1200 with the following additions:
- Quality plastic case
  - Stand
  - Flame tip
  - Hot blow tip
  - Deflector for hot blow tip
  - Hot knife tip
  - Cleaning sponge
  - 2 metal storage trays for hot

tips • Cap and 2.4mm solder tip.

**2 CANS GAS FREE WITH TS-1205 PURCHASE VALUE \$11.90**



### TAP AND DIE SET

21 pc. set. Sizes 3, 4, 5, 6, 7, 8, 10 & 12mm and 1/8". 27 TPI pipe thread. Cat. TD-2114

**Was \$26.95 Save \$6.95 August \$20**

## DUOTECTOR PIR/MICROWAVE DETECTOR

The ultimate in burglar alarm PIRS. Requires both the PIR & Microwave to be triggered at the same time, substantially reducing false alarms.

**1996 Price \$99.50ea**  
**1998 Price \$69.50ea**

**August Price \$59.50 ea**  
**Buy 4 for \$220**

Cat. LA-5012 10 METRE RANGE

## LARGE COMPONENT STORAGE TRAY

The third in a series of resistor & capacitor trays.

This one is the same physical size, but has 15 large storage trays and is 34mm deep. Compartments measure 130mm long, and these are 11 x 45mm wide, 2 x 55mm and 2 x 78mm. Total size is 418(L)x275(W)x399(D)mm. Cat. HB-6343

**Capacitor Tray**  
45 Compartments  
Cat. HB-6344 **\$11.95**

**Resistor Tray**  
88 Compartments Cat. HB-6342 **\$11.95**

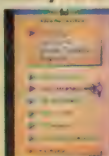


# OVERNIGHT DELIVERY

## SAVE \$\$\$ ON BOOKS

See 98 Cat. for full details.

CAT. #	DESCRIPTION	WAS	NOW	SAVE	PAGE
BB-7031	Feedback - How to Avoid	\$13.95	\$9.95	\$4	215
BB-7054	Model Railway Projects	\$16.95	\$12.95	\$4	217
BB-7422	How to Expand & Repair PC's	\$18.95	\$14.95	\$4	216
BB-7437	Intro to Web PC/Mac Users	\$20.95	\$16.95	\$4	216
BB-7438	Using Netscape on Internet	\$20.95	\$16.95	\$4	216
BB-7439	Microsoft Pub. for Windows 95	\$18.95	\$14.95	\$4	216
BM-2496	Audio and Video Systems	\$17.95	\$13.95	\$4	-
BM-2497	Computer Viruses	\$17.95	\$13.95	\$4	215
BM-4565	Memory Data and Comparisons	\$21.95	\$17.95	\$4	220
BM-4575	Memory IC Data and Equivalents	\$49.95	\$39.95	\$10	221



## 5 BLADE SCRAPER

This tool has many uses around the home, as well as hobbyist use in kit constructing etc. It has a 5 sided 6" blade which will rout, punch, shape, scrape and cut. Ideal for enlarging holes in plastic panels etc, etc. Made from chrome vanadium steel.

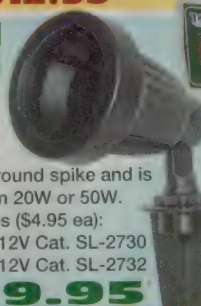
Cat. TD-2116 **Was \$17.95 Save \$5**  
**August Only \$12.95**

## HALOGEN GARDEN LIGHT FITTING

This low voltage landscape light increases security around the house as well as lighting up your garden. It is made of diecast aluminium and is black powder coated. It includes a ground spike and is waterproof. Use 12V halogen lamps in 20W or 50W. (not supplied) Use the following lamps (\$4.95 ea):  
20W 12° 12V Cat. SL-2729 20W 38° 12V Cat. SL-2730  
50W 12° 12V Cat. SL-2731 50W 38° 12V Cat. SL-2732

Cat. SL-2758

**\$19.95**



## VIDEO ENHANCER STABILISER KIT

Refer: E A Nov. 1997  
This kit will give you better quality copies when you dub from one video tape to another.  
See 98 Cat. page 3 for details.

Cat. KA-1798 **\$69.95**



## EASY START CAR JUMP STARTERS

Starts a car in as little as 5 minutes without lifting up the bonnet! It transfers some of the charge from one car (with full battery) to the car with the flat battery.

See 98 Cat. page 85.

Cat. MB-3595

**Was \$39.95**

**Save \$10**

**August \$29.95**

**KEEP ONE IN THE GLOVE BOX**



## BATTERY MADNESS

**AA NICAD 600MA**

Cat. SB-2452 **Were \$2.50**

**August \$2ea.**

**AA NICAD 800MA**

Cat. SB-2450

**Were \$3.50**

**August \$2.75ea.**

**AA NICAD 800MA SOLDER TAGS**

Cat. SB-2451 **Were \$3.75 August \$3ea**

**AA NI-MH 1.1AH** Cat. SB-2455

**Were \$5.25 August \$4.25ea.**

**AA NI-MH 1.1AH SOLDER TAGS**

Cat. SB-2457

**Were \$5.50**

**August \$4.50ea.**



## 4 SECTOR HOUSE ALARM

Budget alarm that works well. Includes 4 sector panel, 1 x PIR, 3 leads and magnets, panic button plus lots more. See 98 Cat. page 76.

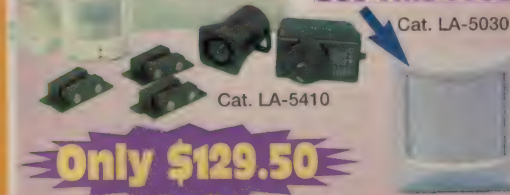
**Buy in August, and receive a Micron PIR free.**

**Buy This**

**FREE PIR**

**Get This Free**

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# 'Front End' for your PC's soundcard

**Here's a low cost preamp/buffer unit that will help you take full advantage of your soundcard's input capabilities for making measurements. It has a high input impedance and can handle a very wide range of signal levels, which makes it an ideal hardware accompaniment to much of the soundcard-based audio measurement software that's available via the Internet.**

by Rob Evans

**W**hile it's a fairly safe bet that most PCs are fitted with a soundcard these days, those of us who aren't heavily into PC games probably use very little of its capabilities. If it's not producing blood-curdling screams during a Quake deathmatch, then it's most likely resigned to a mundane life of generating clangs, beeps and chimes in response to Windows' resource-gobbling activities...

There is however a surprisingly wide range of audio analysis and monitoring software available, that makes very good use of your soundcard and can be extremely useful itself in the process. Mostly using the card's input capabilities, these programs include oscilloscopes, spectrum analysers, FFT (Fast Fourier Transform) processors, circuit response plotters and loudspeaker analyser suites. Not surprisingly there's also quite elaborate audio signal generators on offer, which use the soundcard's signal *output* feature.

The good news about this abundance of interesting software is that a large proportion of it is available through the Internet, either as freeware (pay nothing), shareware (pay a little, depending on your moral stance) or in a restricted demonstration form of the real thing. Even this latter type can be quite useful in itself, as it often performs most of the functions of the fully paid-up version — and the latter in turn is probably well-priced anyway.

As intriguing as this software bonanza may sound though, the programs that make use of the soundcard's line-in socket (almost *all* of them) tend to be thwarted by the restricted nature of the card's input circuitry. More specifically, a soundcard's input has a quite limited dynamic range, a relatively low input impedance and a fairly crude overload protection setup.

In practice then, the program running on



the PC can only monitor low-impedance, moderate-level signals, which really does limit the usefulness of the software. When running an oscilloscope program on your PC, for example, you can't check say the waveform around an op-amp because the soundcard's input will badly load the signal, and you dare not check the output of a hifi amp due to the large (and potentially destructive) size of the signal at that point.

This is of course where our new soundcard preamp box comes in. It offers switchable input level ranges of +20dB to -40dB in four 20dB steps, and importantly, presents a one megohm input impedance in much the same way as a conventional oscilloscope front

end. It can also handle quite severe overload voltages, has a low output impedance, and is equipped with a limit indicator to alert the user when the soundcard's A/D converter has run out of range.

The preamp's circuitry is powered from the +5V outlet on the soundcard's DB15 joystick port connector, and feeds its output signal directly into the card's 3.5mm line-in socket, so it's very easy to hook up to the computer. In fact unlike most specialised PC add-on modules that use the parallel or series port as an interface, the preamp unit it won't interfere with the PC's more common operations, and can therefore be left permanently connected.



## The software

While we really can't provide the details of all the soundcard-based programs here, we've plucked out a couple of interesting oscilloscope programs to give you a taste of what's available. As you can see from the screen shots, they present a pseudo-scope screen plus a range of user controls that attempt to emulate those on a conventional scope. Both offer dual-trace facilities by using the soundcard's left and right channels, display the incoming waveform in real-time, and operate under Windows V3.1 or Windows 95.

The screen shot shown in Fig. 1 is of a quite elaborate scope program from an author in Moscow, which offers delayed trigger, FFT analysis, meter options, and a signal-triggered hold facility for capturing one-off events. Versions are available for both Win3.1 (V2.30) and Win95 (V2.51); however at this stage, both variations only use the soundcard in its 8-bit mode — which rather restricts the scope's vertical resolution.

A quite different style of scope program is shown in Fig. 2, this time from an author in Germany. As you can see, *Audiotester's* menu labels aren't in English, but this turned out to be the only real negative point against this very comprehensive program. It uses the soundcard in its 16-bit mode (or higher, if available), offers a programmable sine/squarewave generator and a Spectrum Analyser along with the Oscilloscope, and has a fully scalable display screen — it can be 'dragged out' to cover all of the PC's screen, regardless of its resolution setting.

*Audiotester* is available to suit both Windows 3.1 and 95, and would be ideal for educational purposes thanks to its large-screen capabilities. And by the way, in response to our email query regarding an English version of the help file, the author replied that the latest update of the Win95 (32-bit) version can be configured to display menu items and controls buttons in English.

All in all, both of the example programs shown here are useful as audio-bandwidth digital oscilloscopes, or at the very least they offer an educational insight into the pros and cons of DSO's. It's quite easy to see how aliasing, plus restrictions in vertical resolution and bandwidth effect digital scopes, and you can also appreciate the advantages of a crisp display that can be 'frozen' at will. Education aside though, it's surprising how effective they can be when combined with our Soundcard Preamp...

To get hold of your own copy of these programs, there are several options. They can be downloaded from the *Electronics Australia* BBS and Internet Website, or sourced from their original (Internet) locations.

From our facilities, the files can be found in the 'EA Project Software' area as



Fig. 1 (above): A screen shot from the 16-bit version of *Oscilloscope* for Windows, shown here in its dual-trace mode. The 'front panel' slider controls can be used for a wide range of adjustments, once you figure out their somewhat cryptic labeling.

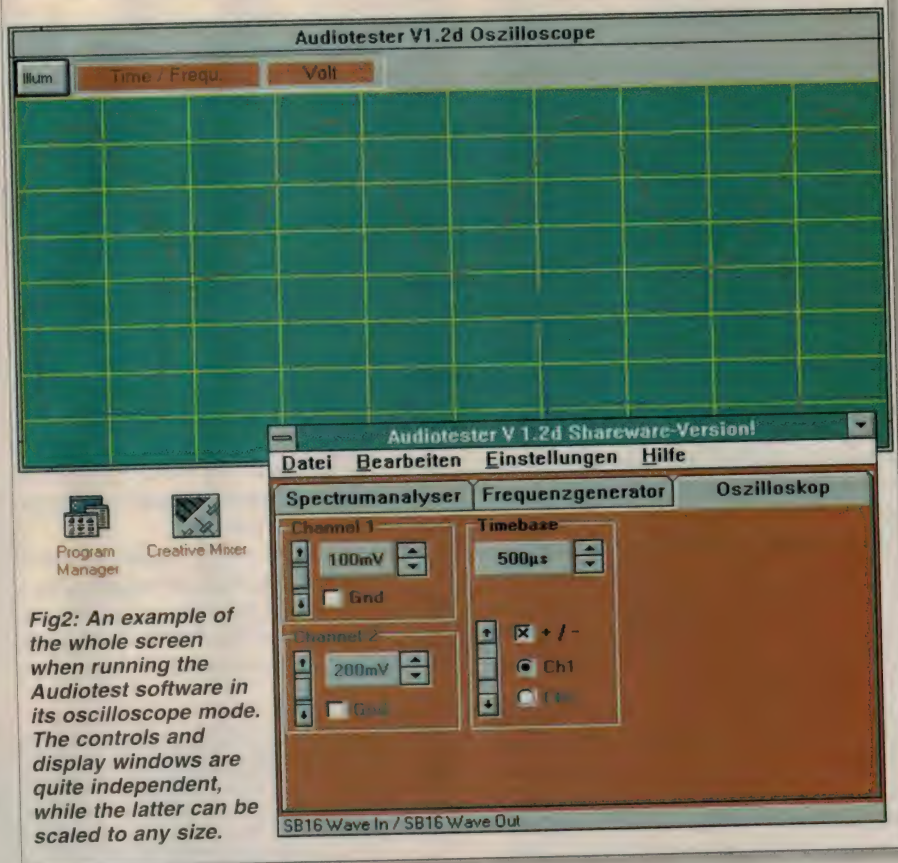


Fig2: An example of the whole screen when running the *Audiotester* software in its oscilloscope mode. The controls and display windows are quite independent, while the latter can be scaled to any size.

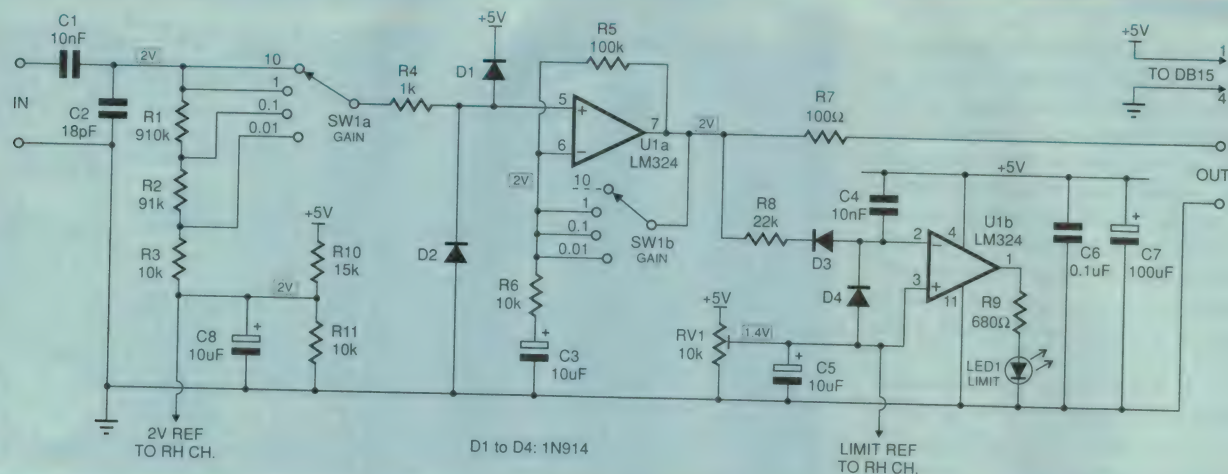
*osc230.zip* and *osc251.zip* for the 16 and 32-bit versions of the *Oscilloscope* program, while the *Audiotester* suite is available as *audiot16.zip* (16-bit) and *aud13d.zip* (32-bit). Note that you'll need the 32-bit version of both programs if you're running Win95.

To check out a wide range of other programs that use soundcards we'd recommend taking a look at <http://web.arca.net/top/> on the Internet. This 'soundcard program collection' site mostly offers links to other sites

containing individual programs, and gives a handy synopsis of each. Note that not all links work though, and to be quite honest, a few of the programs are downright weird and not particularly useful...

Also note that while the *Oscilloscope* program shown here was located via this path, the impressive *Audiotester* package was not listed. We found that at <http://www.lautsprecher.de/>, perhaps proving that a wide and thorough Internet search is often worthwhile.





**Fig.3:** The preamp's circuit is based around attenuator R1 to R3 and gain stage U1a, which combine to offer an overall gain range of +20dB to -40dB in SW1's four steps. U1b activates LED1 when the preamp's output level exceeds the soundcard's input range.

### About the circuit

The soundcard preamp's schematic is shown in Fig.3, which includes the circuitry for the unit's left channel plus the voltage reference and bypass capacitors common to both channels — as you'd expect, the basic circuit for the right channel is identical to the left. The circuit is based on a simple three-level attenuator (R1 to R3) which feeds a non-inverting amplifier stage formed by U1a, where the attenuation and gain for these two stages is determined by the position of SW1 (GAIN).

Taking a closer look at the circuit, input signals are coupled to the attenuator stage at R1 via AC coupling capacitor C1, while the input is bypassed at high frequencies by C2. The three-step attenuator divides the input signal by one, 10 and 100 (0dB, -20dB and -40dB), and the level selected by SW1a is passed to the following preamp stage U1a (pin 5) via isolating resistor R4. This resistor also acts with protection diodes D1 and D2 to hold the incoming signal within the circuit's power supply range.

Since the circuit operates from a single-ended 5V supply — courtesy of the soundcard joystick port — the op-amp stages are biased at around half of the supply rail by the voltage divider formed by R10 and R11. Here, the 2V reference level is bypassed by C8 then applied to U1a's non-inverting input via the attenuator network (R1 to R3) and R4.

Note that a 2V standing level has been used rather than exactly half of the supply voltage (2.5V), since the LM324 op-amp outputs can swing from about 0 to 4V with a 5V supply. In short, the 2V bias level guarantees symmetrical output clipping.

By the way, we've elected to use a low-cost

LM324 quad op-amp here rather than a more sophisticated chip, since despite its fairly mundane noise and bandwidth performance it's quite adequate for the job. Plus of course, very few (readily available) op-amps can perform reliably with a supply rail of just 5V...

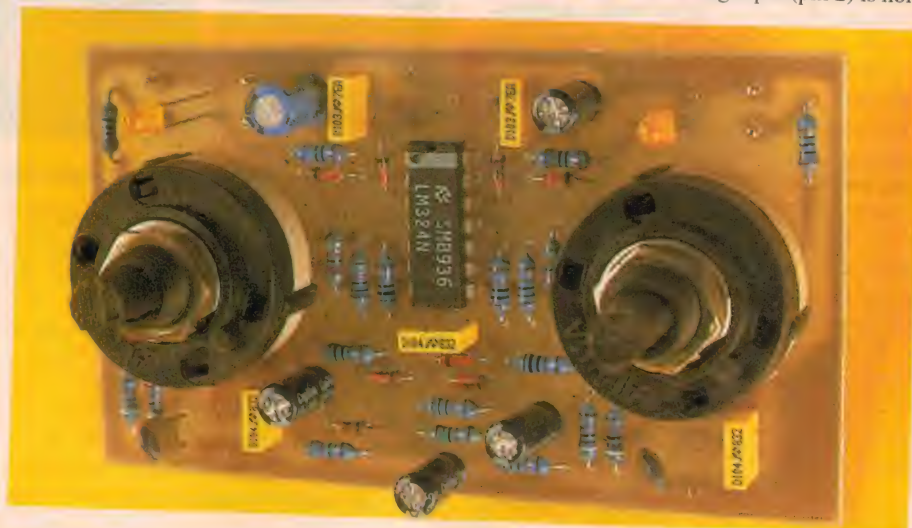
If you want to capitalise on the full resolution offered by programs that use the soundcard's A/D in its 16-bit mode though, you'll need to fit a higher-performance quad op-amp such as the TL074. This in turn means that the +5V supply from the joystick port will need to be replaced by a higher voltage DC level from a separate source, since the TL074 needs a supply of at least +/-4V (8V total). However, the performance of the LM324 is sufficient for most applications, plus of course, the proposed +5V connection scheme is very convenient.

Returning to the circuit, signals applied at U1a's non-inverting input are amplified by a factor of 10 or one depending upon the position of gain/level switch SW1b. In the position shown in the schematic, U1a is set to

gain of 10 by feedback network resistors R5 and R6 plus AC coupling capacitor C3. The remaining switch positions (1, 0.1 and 0.01) set the op-amp gain to one by shorting out feedback resistor R5.

With SW1a/b in the '10' position as shown then, there is 0dB attenuation at the input plus 20dB of gain contributed by U1a, therefore setting the overall preamp gain at that figure. This combination of input attenuation and U1a's gain gives the required 20dB, 0dB, -20dB and -40dB levels of pre-amp gain, while maintaining a constant input impedance of around one megohm (R1 + R2 + R3). All in all, this is a flexible enough arrangement for most applications, including a simple oscilloscope front end.

The now buffered and amplified (or attenuated) input signal is passed to the preamp's output via isolating resistor R7, and also feeds the limit indicator circuit (U1b) via R8. Here, the op-amp's non-inverting input (pin 3) is fixed at a reference level (say, 1V) by RV1, while the inverting input (pin 2) is non-



**The assembled preamp circuit board, ready to be installed in the case.**



ally held at about 2.6V by U1a's nominal 2V output, plus the voltage drop across D3. (Note that the op-amp's PNP transistor input stage will source a small amount of current, holding D3 forward biased.)

In its static (no input signal) state then, the levels at U1b's inputs will force the output (pin 1) low, which in turn holds LED1 off via its limiting resistor R9. U1b's output will then stay at a low level until U1a's output signal is greater than 3.2V peak-to-peak — that is, 1.6V peak.

At this point, the negative half-wave rectifier action of D3 will drive U1b's inverting input from 2.6V down to less than 1V, which in turn forces the op-amp's output high and thereby activates the limit indicator LED1. Note that C4 smooths the rectified signal, while the current sourcing effect of the op-amp's inverting input (as mentioned above) acts as a pull-up resistor of a few megohms — effectively, the discharge resistor for C4.

Diode D4 has been included to limit the rectified signal at U1b's inverting input to around 0.6V below the reference voltage at RV1 — C5 ensures a low impedance AC path. Without D4 an increasing input signal strength (in this example, more than 3.2V p-p) will cause a greater charge on C4 and therefore a longer discharge time when the signal falls away. The practical effect of this is that LED1 would stay on for much longer in response to a larger overload signal, making the limit indicator difficult to read.

With the arrangement as shown however, the excess signal is dropped across R8 thanks to the limiting action of D4, so the circuit is only ever 'overdriven' by a small and consistent amount. As a result, the LED's activity will accurately track signals that exceed the preset limit level, as determined by the setting of RV1. This is set so that the LED reflects the limit of the soundcard's input voltage range, which will be less

than that of the preamp itself — but more on this adjustment later.

The remaining parts of the schematic diagram show supply bypass capacitors C7 and C6, plus a couple of links to the matching locations in the right channel's circuit. These are from the 2V reference circuit (R10/R11,



**Note that both RV1 and the external wiring PCB pins are fitted to the copper side of the board.**

etc.) and the limit reference voltage at the wiper of RV1, so only one limit adjustment is needed for both channels.

## Construction

The soundcard preamp is very easy to put together, with all of the components held on one small PCB (code 98sci7) measuring 52 x 92mm. The complete assembly is mounted into the box panel via the two rotary switch shafts, while flying leads are used to connect to the PC's joystick port (+5V power) and the soundcard line-in socket.

Begin the construction in the usual way by installing all of the lower profile components first (resistors and diodes), then moving on to the larger parts. As always, take particular care with the orientation of the semiconductors and electrolytic capacitors, and refer to the compo-

nent overlay diagram at all times. We used PCB pins for the external connection points by the way, but since the PCB assembly is mounted directly onto the box panel the pins were fitted to the copper side of the board.

This may be the best mounting method for the trimpot as well, since it will need to be adjusted to suit the PC's soundcard when the preamp is up and running. On the other hand, if you drill an access hole through the board, the trimpot could be installed on the component side in the normal way.

Other than that, note that the LEDs and BNC sockets must be left until last, and the rotary switches should be fitted hard down on the board with the locating spigot positioned as shown on the overlay diagram — this will make the shaft flats line up with the knob grub screws. Also, make sure that the range positioning ring on each rotary switch is set for four positions, rather than the default six.

At this point it's probably a good idea to test the assembly before it's installed in the case, since this final process is a little messy to reverse should the unit need fault-finding.

To perform an initial check, first install and solder the LEDs at their full leg length, as their height above the board will need to be adjusted later. Then connect a +5V power source (from a bench supply or the soundcard) and check that the circuit's 2V bias point, and pins 7 and 8 of U1 settle at this level. Next select the 0.01 gain position on each channel and confirm that the state of the limit LEDs can be controlled by adjusting RV1 — this indicates that the limit detector circuit (U1b) is functional.

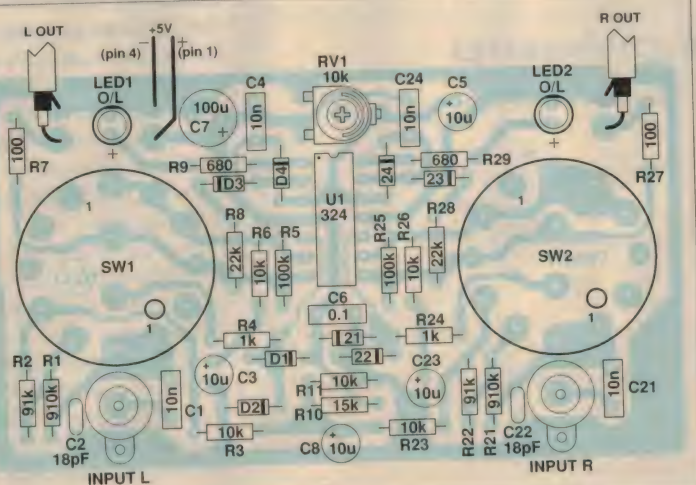
With RV1's adjustment temporarily set so that the limit LEDs are just off, now place your finger on the PCB input socket pad of each channel, while winding up the matching GAIN rotary switch. This is the proverbial 'blurt' test, and should cause the channel's limit LED to activate when the GAIN control is in the 1 or 0.1 position.

Once these tests have been completed you can be confident that the preamp circuit is functioning and ready to be installed in the box. Start this job by desoldering the LEDs so they are free to move in the pad holes, then fit the BNC sockets into the box panel with generous lengths of tinned copper wire soldered to their lugs — that's a total of four lengths.

By the way, if the BNC socket locking nuts are fairly large, check if they will foul the bodies of the rotary switches when the board assembly is installed. If this looks to be the case, installing a spacer washer on each rotary switch shaft should sort out the problem.

The completed board assembly can now be eased into the box front panel, with the copper wires from the BNC connector slid-

**Follow this overlay diagram carefully when assembling the unit. Note that the +5V supply cable is terminated in a DB15 line plug with the pin connections shown, so that power can be extracted from the soundcard's joystick port.**





ing through their matching pad holes — don't let the wires kink during this process. When the assembly is fully home, the rotary switch locknuts can be fitted and the LEDs pushed up into their matching front panel holes, then soldered in place.

Next, solder the BNC socket extension wires to the board. Then connect the power and output signal cables to their correct PCB pins, as shown in the overlay diagram. Take particular care with the polarity of the +5V power cable, since a mistake here will probably destroy U1 and C7, and could even damage the soundcard's 5V outlet circuitry. Note that we used pins one and four on the DB15 joystick port connector, where pin 1 is positive and pin 4 is the 0V/ground connection.

The signal-out lead to the soundcard is terminated in a stereo 3.5mm plug, and depending on the size of its cover will suit either figure-eight or twin-core shielded cable. At the preamp board end, the figure-eight type can be split into individual leads then connected to the PCB as shown in the overlay diagram. The twin cored cable type will need to be connected at the PCB pins for one channel, then the remaining wire core run across to the output pin on other side of the board.

### Limit LED setup

As mentioned above, the limit indicator circuit's threshold will need to be adjusted to suit the soundcard you'll be using, via trimpot RV1. This is set so the limit LED will come on *just* as the soundcard's A/D converter has run out of range, so you'll really need a test signal source to complete the job.

If you don't have access to an audio oscillator though, you can just adjust RV1 so that the voltage on its wiper reads close to 1.4V, as this setting seems to suit the A/D input range in the industry-standard Soundblaster cards. This in turn equates to a (roughly) 0.8V RMS signal at the sound card input socket, with the software-controlled A/D gain set at full — that is, its 'line-in' level setting fully up.

This is in fact the best way to arrange the soundcard when using our preamp unit, since with the line-in level set to maximum, the card's A/D will run out of range before any of the preceding analog stages clip — including the input circuitry in the soundcard itself. It also means that you have a gain structure that's easy to go back to each time you use the preamp unit, plus

### PARTS LIST

#### Resistors

R1,21	910k
R2,22	91k
R3,6,11,	
23,26	10k
R4,24	1k
R5,25	100k
R7,27	100 ohms
R8,28	22k
R9,29	680 ohms
R10	15k
RV1	10k horiz. trimpot

#### Capacitors

C1,4,21,24	10nF MKT
C2,22	18pF ceramic
C3,5,8,23	10uF 16V electrolytic
C6	0.1uF MKT
C7	100uF 16V electrolytic

#### Semiconductors

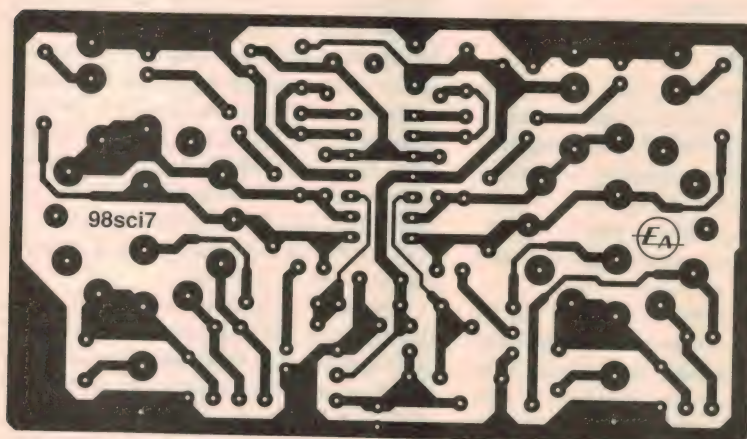
U1	LM324 quad op-amp
LED1,2	3mm LEDs
D1-4,21-24	1N914 signal diodes

#### Switches

SW1,2	2-pole PC-mount rotary switches
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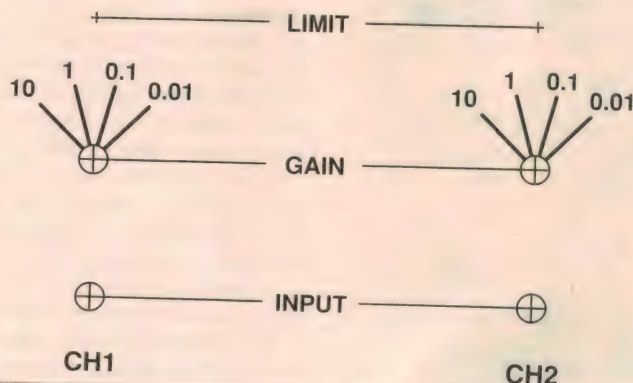
#### Miscellaneous

2 x panel-mount BNC sockets, 3.5mm stereo line plug, DB15 line plug with backshell, knobs for rotary switches, 41 x 68 x 130mm zippy/jiffy box, 52 x 92mm PCB (code 98sci7), twin-core or figure-eight shielded cable, light-duty twin cable.



The full-sized circuit board pattern shown on the left can be used to make your own PCB, while the front panel artwork below will suit a standard zippy/jiffy box.

### Soundcard preamp



you'll always be sure that the limit LEDs are telling the true story.

Another point worth mentioning about the soundcard setup is that if the card's mixer/controller software has tone control adjustment capabilities, these should be either bypassed or set for a flat frequency response. The mixer's main (output) volume control can be used to some advantage though, since this will control the signal level sent to the soundcard speakers, allowing you to also *hear* the signal you're monitoring with an oscilloscope program...

Getting back to the preamp's setup, the limit LED circuit can be calibrated from a (preferably 1kHz sinewave) test oscillator by using a scope program on the PC to monitor the preamp's output waveform, then slowly winding up the oscillator level until the scope waveform just begins to flatten on top. If the soundcard's line-in control is set at full, then you can be quite sure that this effect represents the full range of the card's A/D converter.

You can now adjust RV1 so that the limit LEDs have only just come on, and you're ready to roll. By the way, with the preamp's GAIN switch set to one (1), the scope waveform should start to clip as the oscillator output reaches about 0.8V RMS (when using a typical soundcard). Also note that the preamp has a maximum output of about 1.4V RMS, so the soundcard's input signal is still 'clean' as the A/D runs out of range. ♦



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# Moffat's Madhouse

## Good old 'Eff-Tee-Pee'...



This is another one of those 'Moffat wanders back into the past' articles. But perhaps we'll drag out some useful ideas for the present, and maybe even the future too. To those of you who are sick and tired of slogging through numerous web pages on the Internet to get to some interesting file downloads, relief is at hand.

For some background, let's go back to the good old days — the early 80's. Back then there was no Internet, at least for public consumption, so computer users who wanted to go online had to connect with a local 'bulletin board'. These BBS's had a rudimentary e-mail service, and message areas similar to today's newsgroups, but most of us accessed the bulletin boards for one main purpose: free software.

What a goldmine! Hundreds of files of free and shareware programs, there for the asking.

All you had to do was say 'gimme!' and some program or other would come dribbling down the phone line, right into your computer. My first modem was a home-brew 300-baud screamer, and a file download of only 10KB seemed to take forever. Now we can move data at up to 56k, 186 times as fast. But even at 300 baud, many of us downloaded software just because it was there, even if there was no need for it. Get it first, then find a use for it!

There were some memorable BBS's in Hobart when I lived there, with names like Mike's Place, Crazy House, Rambling Ram, Datamation, and Silver's Stringline. These sites were generally set up in one guy's house, and he paid for the computer, modem, power, phone lines, the lot. Many services had only one phone line and modem, a far cry from today's Internet Service Providers with modems by the hundreds. So busy signals were the order of the day. But these BBS's were either free to users, or very cheap — in the order of \$20 a year. So nobody could complain about a few busy signals.

One history-making BBS was run by the Island State Credit Union. Their 'computer guy' was an online enthusiast, and he

arranged things so that people from the outside could dial into the Credit Union's big mainframe computer and exchange messages, software, and so on. But most interesting was the ability to do online banking. You could phone in with your modem, give a password and PIN number, and then check your account balance or transfer money from one account to another. You could also fill out an online form which would cause the Credit Union to issue a cheque in your name; then they'd even pay the postage to send it off to some creditor. Today when I see all the hype about online banking here in the USA, I simply say, "Oh yeah, in Australia we were doing that back in 1983". That stops them in their tracks!

The BBS system thrived until the first rumblings of the Internet came on the scene. The early Internet looked much like the bul-

Like the bulletin board system, the early Internet offered e-mail, and the ability to download software by the ton. In addition there was the Telnet service, in which you could log onto some computer on the other side of the world and use it as if you were seated right in front of it. Telnet is still frequently used for jobs such as logging into your public library's computer and searching their card catalog.

Software downloads (and uploads) were handled by a service called File Transfer Protocol, or 'FTP'. You could FTP your way onto some site, work your way down through various directories, and then find some interesting software, free for the asking. Issuing a simple 'GET' command would shoot it down the line and into your computer.

We're talking in the past tense here, but that's not correct at all, because services like Telnet and FTP still exist on the Internet. They have just been kind of 'hidden' by the modern World Wide Web...

### It's still there

It's very important to realize that the Web is simply another service that rides upon the Internet, just as Telnet and FTP do. Many people see the World Wide Web AS the Internet, but that just ain't so. So today is your lucky day: Stuff such as FTP is waiting to serve you, and now you're going to find out how.

Why bother with FTP? There are plenty of places already on the Web where you can download software — Jumbo.com, Download.com, Tucows, you name it. They have all the latest software, served up on a silver platter. But what they often don't have is the earlier software; in partic-

ular some of the fine MS-DOS stuff that was around before Windows came along. As I have mentioned before, I am a firm believer in MS-DOS; right now I'm using the DOS-based VDE word processor to write this column. It runs circles around anything Windows has to offer, as far as I'm concerned.

But wait! There's more! Poking around FTP sites, you can even find software written for CP/M, the operating system that ruled

```
220-*****
220 hayes.com FTP server (IPAD 1.52) ready at Mon May 11 12:22:07 1998
Enter user name: anonymous
331 Anonymous logins ok. Please enter your e-mail address as password.
Password:
230 User anonymous logged in.
ftp> dir
200 Port command successful.
150 Opening ASCII mode data connection for LIST / (770 bytes).
-r--r--r-- 1 root ftp 870 Apr 27 17:22 00_index
dr-xr-xr-x 1 root ftp 0 Dec 08 1997 catalog
dr-xr-xr-x 1 root ftp 0 Nov 06 1997 esp
dr-xr-xr-x 1 root ftp 0 Nov 06 1997 mac
dr-xr-xr-x 1 root ftp 0 Dec 08 1997 manuals
dr-xr-xr-x 1 root ftp 0 Nov 06 1997 modem
dr-xr-xr-x 1 root ftp 0 Nov 06 1997 other
dr-xr-xr-x 1 root ftp 0 Nov 06 1997 press
dr-xr-xr-x 1 root ftp 0 Nov 06 1997 prodinfo
dr-xr-xr-x 1 root ftp 0 Nov 06 1997 software
dr-xr-xr-x 1 root ftp 0 Nov 06 1997 techtips
dr-xr-xr-x 1 root ftp 0 Nov 06 1997 utility
dr-xr-xr-x 1 root ftp 0 Apr 27 17:16 webonly
LIST: 770 bytes in 20 sec (38/sec)
226 Transfer complete.
ftp>
```

Fig.1: The anatomy of a simple FTP file transfer, made using the KA9Q TCP/IP software running under DOS.

letin boards: text only, driven by typing cryptic commands. The Internet was universally based on the Unix operating system — a bit like MS-DOS, only more complicated. Unix is industrial-strength stuff, and it's still the operating system of choice for most Internet sites around the world.



the world before MS-DOS came along with the IBM-PC computers. There are still plenty of CP/M computers out there, lovingly cared for by people who aren't compelled to own the very latest. And — remember Atari? Or the Tandy TRS-80? you can still find downloadable software for them on the FTP sites. Commodore Amiga too. Even Commodore 64. Ah, the good old days...

Another of the joys of FTP sites is the sheer speed of using them. There are no graphics, no pretty advertisements at the top of the screen, no fancy icons for you to click on, only text. When you hit an FTP site, it zips onto the screen. You move up and down through the site's directories quick as a flash, since they are also text-only. And, with the Opera browser at least, direct FTP downloads seem much faster than the HTTP variety normally used on web sites.

Until fairly recently, many Internet Service Providers offered something called 'shell accounts'. These were text-only, command line systems that only required a simple terminal program to do your stuff on the Internet with Telnet, FTP, and e-mail. But as the World Wide Web and graphics interfaces and monster web browsers prevail, shell accounts are becoming harder and harder to find, at least in this part of the USA.

I still wanted the ability to do FTP and Telnet using MS-DOS, just like in the good old days, and I soon discovered a way to do it using the KA9Q TCP/IP software originally designed for use on packet radio. This time the TCP/IP 'stack' connected to a telephone connection rather than a packet radio connection. The thing worked great, still does in fact, and for all practical purposes it's identical with the traditional Unix shell account. However, in this version there is no e-mail.

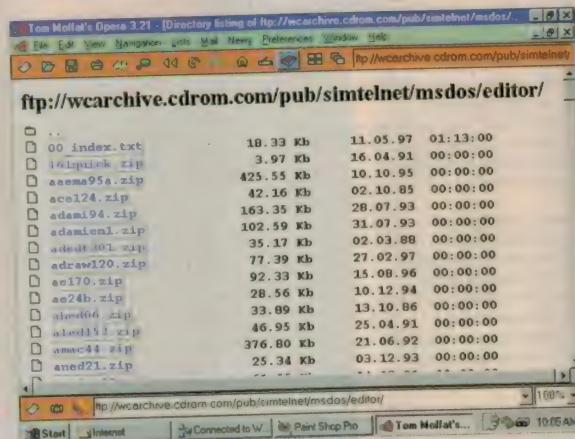
Fig.1 shows how it looks on the computer screen, a familiar sight to Internet old-timers. In this case the site being accessed is the Hayes modem manufacturer, where you can download instruction manuals, drivers, or upgrades for your modem.

It isn't necessary to revert to MS-DOS to be able to use FTP or Telnet. It's likely that there are programs to do this within your Windows directory, called (wait for it!) FTP.EXE and TELNET.EXE. As well, any World Wide Web browser can handle FTP, it's just that you seldom see it occurring unless you carefully keep watch on addresses the browser is accessing. Instead of 'http://www.site\_name.com', for example, you might see 'ftp://ftp.site\_name.com'. FTP is considered the most efficient way to transfer large files, so many web sites choose to use it.

When you first enter an FTP site, you are

asked for a username and password. For sites available to the great unwashed masses, the username 'anonymous' usually lets you in, and for a password they generally want your e-mail address. Clever web browsers are able to supply this information automatically; you never see it happening.

With this information at hand, it's easy to take control of your web browser and send it directly to an FTP site, without accessing some world wide web page first. Say you would like to explore one of the big download sites to find a new MS-DOS text editor to play



**Fig.2: How a typical FTP site is displayed on the screen when you're using the Opera WWW browser.**

around with. All you have to do is go to your browser's address line and type in, say **ftp://wcache.cdrom.com/pub/simtelnet/msdos/editor/**

What does this address mean? Well, **wcache.cdrom.com** is a very large and busy FTP site, **pub** means you are in a public file area where anonymous visits are permitted; **simtelnet** is a big distributor of software; **wcache** contains a 'mirror' of the Simtel software repository, plus some others; **msdos** is for DOS-based software, and **editor** is the area where all the text editors live.

Near the top of most FTP directories you will find a file called **00\_INDEX.TXT** or something similar. This file is a description of all the goodies to be found in that directory. Click on **00\_INDEX** to display it, write down the filenames of interest, and then go for it.

Fig.2 shows how this FTP site is presented on the screen of the Opera WWW browser. The display should be very similar with other browsers. You click on the filename you want to download, which causes your browser to issue the GET command to the FTP site. You will probably be asked what you want to do with the file being downloaded. Save it in some convenient place; I use a directory called 'download'.

Once you've got manual FTP operation

under control, you can save handy FTP sites as bookmarks in your browser, just like WWW sites. Here are some FTP sites you might want to put into your bookmarks:

**ftp://wcache.cdrom.com/pub/simtelnet/**

**ftp://ftp.tas.gov.au**

**ftp://oak.oakland.edu/pub**

**ftp://papa.indstate.edu/mirror**

**ftp://ftp.tucows.com/pub/**

It should be pointed out that a WWW browser is not capable of sending material to an FTP site, it can only receive. This is really

of no consequence, though, since very few people (other than site administrators) actually load stuff onto an FTP site. If you tried, you probably wouldn't be allowed access, other than to a special 'incoming' directory where the site administrator can inspect files before they are posted for public access.

The only instance where you are likely to want to upload to a site is if you have your own WWW page. In this case you must be able to send your web page designs to the site, along with any graphics or other files that go with them. FTP is the usual way of doing this, but since your browser

can't upload, you'll need another special FTP program to do the job. Good ones are free-ware programs such as **WS\_FTP** and **CuteFTP**.

So here is another example of how stepping back into the past can produce rewards few people have thought about, since the REAL Internet became hidden by all the glitz of the World Wide Web. It's certainly worth exploring — it's a whole new field of software and information. ♦

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# ALTRONICS COMPONENTS

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I am pleased to announce the release of the fantastic Do-It-Yourself Home Theatre Loudspeaker Kit. It is so easy to construct, your friends won't believe you've built it! Also featuring this month are the fabulous range of Uptek digital multimeters; these represent exceptional value for money. As some products have been discounted heavily, be quick or you may miss out! Remember our **FAST JET SERVICE** delivers to your door the next day!

(Country areas please allow an additional 24-48 hours)  
Best Regards,  
Jack O'Donnell, Managing Director

## Hi-Fi & Home Theatre Loudspeaker Kit

*"They sound great with any music from classic to rock, from Mozart to Metallica."*

Leo Simpson, *Silicon Chip Magazine*

Designed by acclaimed Australian loudspeaker designer Richard Priddle, these speakers are engineered to deliver superb sound quality whilst being incredibly simple to assemble.

- **Enclosures.** The cabinets are precision crafted on CNC machinery from high quality MDF material, and feature a new and simple construction method which provides incredible joint integrity. Each panel is cut with close-tolerance precision to ensure the enclosures fit together as designed, without leaving unsightly overhangs, leaking air gaps or mis-matched veneer. All driver, port and terminal holes are pre-cut and recessed. Speaker grille is pre-covered in acoustic cloth ready to fit.

- **Drivers.** The loudspeakers feature our new series of polypropylene hi-fi drivers, exclusive to Altronics in Australia. The 6.5" woofers produce deep, punchy bass and maintain their response through the mid-frequencies to provide a linearity of response most two-way systems cannot hope to reproduce. The fabric dome tweeter handles the most demanding of top-end program with ease, producing crisp, clean highs and exquisite detail.

- **Crossovers.** The crossover has been computer-optimised to deliver the best sound quality when coupled with these drivers and enclosure. It uses high quality capacitors and low-impedance inductors to minimise signal colouration and phase-error.

- **Kit Components.** The kit includes flat-packed cabinets, drivers, crossover components, terminals, speaker wire, port tube, acoustic wadding and detailed assembly instructions. In fact, all you need except a bottle of PVA adhesive.

**FEATURES:** • No electronics expertise required. Simple step-by-step assembly instructions included. • No special tools required, all sections are pre-cut and machined. Typical assembly time 2 to 3 hours. • Fully pre-assembled 2nd order, impedance matched crossover. • Everything supplied, all you will need is PVA adhesive.

C 3300 Complete Kit **\$599** plus delivery

CA3300 Kit(Less Cabinet) **\$339** plus delivery

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Delivery Fee of \$25 applies to C 3300 and  
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As featured in *Silicon  
Chip* August 1998 issue!

"Virtually anyone can construct these speakers, whether they have wood-working skills or not. No special tools are required, although you will need a bottle of PVA glue. Once assembled, you will have a set of speakers you can really be proud of. In my opinion, these are comparable to speaker systems costing \$1000 or more. In fact, they look and sound so good, your friends will not believe you built them yourself."

Leo Simpson, *Silicon Chip Magazine*

## WHOPPER WIRE!

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Massive power handling, flexible and super tough translucent insulation.

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### SPECIAL OFFER!

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*That's just \$1 a metre!*

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Featuring: • 8 Appliance Modes

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Backlighting - Once Activated,

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seconds, saving batteries! (Unlike

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1997/98 Catalogue p170

A 1000 Normally \$199,

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Features twin thermocouples, one inbuilt, and one on a 3m external lead. The display maybe

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**Specifications:** • 3.5 Digits, 13mm High • 200mV..2, 20, 200, 1000 V DC Ranges • 10MΩ input impedance • 9V DC Power Supply • ±0.5% (2 digit) Accuracy • Dimensions: 55W x 35H mm

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Premium Grade

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Z 0002 Normal Value \$25

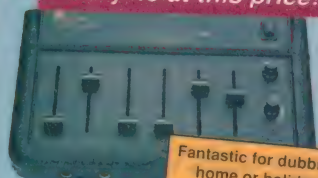
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Great for dubbing videos, multimedia, or as a basic PA mixer. Two 6.35mm mic inputs, two RCA stereo line inputs, and two RCA stereo phono inputs. Assignable headphone monitor, LED output level indicators and two stereo outputs.

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## Laser Pointers

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A 0201 Normally \$69, NOW ONLY **\$35**

### WARNING ON HIGH INTENSITY LASER POINTERS

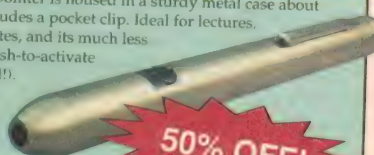
Whereas we are unaware of any of our customers (being principally engineers and electronic enthusiasts) irresponsibly using laser products, pointing towards the eye of any human or animal could cause eye damage and lead to criminal charges. Altronics is limiting the power output rating of all new stocks to 1mW. Current stocks approx. 3mW are not available to persons under 18 years of age and are sold on the strict understanding they will not be left where they could fall into the hands of juveniles or irresponsible persons.

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Supplied with soft leatherette storage case.

A 0200 Normally \$99,

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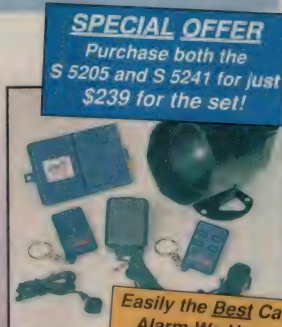
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Secure your vehicle with this versatile TITAN car security system. System kit includes alarm module, two remote controls, battery backup siren, shock sensor, valet switch, status LED, wiring harness and hardware. **Features:** • Two remote controls • Super Loud 127dB siren • Remote panic • Battery backup and tamper proof siren • Child proofing and anti intrusion alert while driving • User selectable exit delay and auto re-arming • User selectable arming/disarming chirp • Starter kill • Valet mode • Automatic shunt of defective entry zone • Alarm memory indicates which zone (1-3) triggered • 60 second siren with auto reset • Two colour LED indicator • Can be interfaced with central locking (where fitted) • 3 extra channels on remote to control features such as boot release, etc.

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- Resistance < 320Ω - 30MΩ
- Continuity Buzzer
- AC/DC Current < 320µA - 10A
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- Resistance < 200Ω - 20MΩ
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### TRUE RMS 34 Range DMM

- True RMS AC measurement to 5kHz
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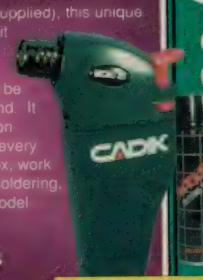
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Powered by a reliable gas lighter (supplied), this unique blow torch burns at 1300°C, making it ideal for all types of brazing and heavy duty soldering. With its ergonomic design, the Micro Jet can be ignited and used simply with one hand. It has an in-built piezo electronic ignition system which ensures easy lighting every time. Ideal for the workshop, tool box, work bench etc. Suitable for heavy duty soldering, brazing, silver soldering, hobbies, model construction etc.

T 2490 \$24.95  
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T 2447 200g Gas Refill \$4.95

**BONUS THIS MONTH!** Purchase any one of these excellent digital multimeters, and receive a shock-proof rubber carry holster (Q 1115), valued at \$12.95, absolutely **FREE!!**

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# ALTRONICS COMPONENTS

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Altronics Kit comes complete with two headset/mic!

(See EA July '98)  
Communication between the rider and pillion passenger on a motorcycle can be difficult when you are moving at 100kph. This project allows hands free communication between the rider and

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• Separate battery supply (4 x AA) or motorcycle system supply • Low & high pass filters to reduce vibration & wind noise through the mic  
• VOX on/off • Single volume control for both channels • Supplied in an attractive case small enough to fit into a jacket pocket.

K 5270 **\$45** (Helmet not supplied)

## Sustain Unit Kit for Electric Guitars



Add sustain to your range of guitar FX at a fraction of the cost of a commercial unit!

(See SC Apr '98) A sustain unit can make your guitar sound a little more "live", by keeping the volume of a note at a constant level while the string resonance dies away. It's one of the most widely used guitar effects (FX), and this simple kit is a fraction of the cost of a commercial unit! It features adjustable attack and decay, a defeat switch and standard 6.35mm input/output jack sockets. Requires a 12V DC power supply. Supplied short form so you can build it into a custom case, if required.

K 5539 **\$27.95**  
Plugpack to suit M 9664 \$14.50

## Beat Triggered Strobe Kit



(See SC Aug '98)

You've seen these in Nightclubs and rock concerts. Strobes add super lighting effects in darkened entertaining areas. It is sure to add tons of life to any party or B.B.Q. **Features:** • Variable rate and sensitivity for beat settings • Line source inputs for beat triggering • Selectable beat / continuous functions • Simplified construction to its predecessor • Powered from a standard 240V mains source • MDF box, carpet, robust aluminium reflector (unlike others on the market) and all the necessary components for a single strobe model. Also available is a second tube option for those who need twice the light.

K 5792 **\$159**  
K 5797 Two Tube Option \$18.95

**NEW!**

## 12V Halogen Discolight Kit

(See SC Jan/Feb '98) Based on the original Silicon chip Discolight, this unit offers the same features as the mains version only with low voltage rails, making it ideal as a school project or to add something different to your car at the next car show or auto salon! Supplied with an attractive case with pre-punched and screened front panel and parts to build and power the unit from 12V DC (halogen lamps not supplied). **Features:** • 4 channels (20W or 50W halogen lamps) • Forward, reverse and auto reversing chaser patterns with music modulation • Simultaneous strobe on all channels • Alternating light patterns • 12V DC or AC operation • Input from loudspeakers, aux level or mic.

K 5807 **\$159** (Lamps not supplied)

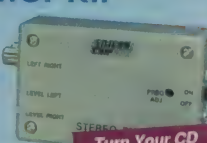
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(See EA August '98)  
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(See SC Oct '88)

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# Information Centre

by Peter Phillips

## Is your computer, fax, microwave or VCR '2000 compliant'?

**Our letters this month cover topics that include charging a lead-acid cell (what's so difficult about that, you say — but read on), electromagnetic induction and TIG welding. We also have an answer to static electricity problems with nylon carpet, and there's more discussion on input resistance. But first, a few words on the 'millennium' or 'Y2K' bug...**

I included a letter in the June issue from a reader asking about the possible effects of the Y2K bug on home appliances, such as a microwave oven or a remote control for a VCR. While it's impossible to predict the effects, a recent documentary on SBS TV gave what I consider to be an excellent overview of the problem. The program looked at possible effects of the bug, what's being done about it, and in general made some very interesting points.

There's no doubt this is a huge problem, with an estimated worldwide cost of \$1500 billion to fix. In Australia, Telstra has already budgeted \$500 million, Ansett Airlines has been working on it since 1994, employing a team of programmers to examine over 20 million lines of code. The Commonwealth bank, in an attempt to make just one building 2000 proof, claimed to have examined some 25,000 microcontrollers.

The problem itself is quite simple, as most readers know. Basically, a lot of software (including the firmware in a microcontroller) assumes the date is for a year somewhere between 1900 and 1999. So at the end of the millennium, a lot of current software will effectively click back to the year 1900, instead of 2000. Apparently

some versions of DOS will revert to 1980, when DOS was first released.

The real problem however is the unpredictable results that can happen when the date is part of a calculation or computation. Anyone who has written software will know that even the smallest bug can cause incredible effects, like a loose cannon in a shopping mall.

A common effect is for the software to 'hang', and the only way to regain control is to manually reset the program. Not a good thing if the software is controlling aircraft around an airport, for example! But the reality is, often no one can tell what the effects will be. The only answer is to rewrite the software to make it '2000 compliant'.

And this is seen by some as the most serious problem we've ever faced. According to the SBS documentary, everyone on the planet will be affected, and predictions generally include a downturn in the economy. This might seem alarmist, but there are good reasons for this prediction, which I'll briefly outline.

Most companies rely on computer systems to keep track of stock movements. So if you are a small company supplying parts to a larger company, after January 1, 2000 your computer system might get it wrong and assume stock has already been sent. This could create a snowball effect, with production being affected in all companies in the chain.

But there's good news for Australia if we take the problem seriously. According to the SBS program, countries in Europe and Asia are too busy dealing with local problems to really tackle the Y2K bug. In Europe, there's a lot of effort being put into the new common currency, and Asian countries currently have, as we know, many other pressing problems to deal with.

As a result, manufacturing companies taking the problem seriously are restricting their dealings to supplier companies that are 2000 compliant. So if your company is compliant, it's more likely you'll win the contract. The Australian Stock Exchange asked all listed companies to provide, by June 30 1998,

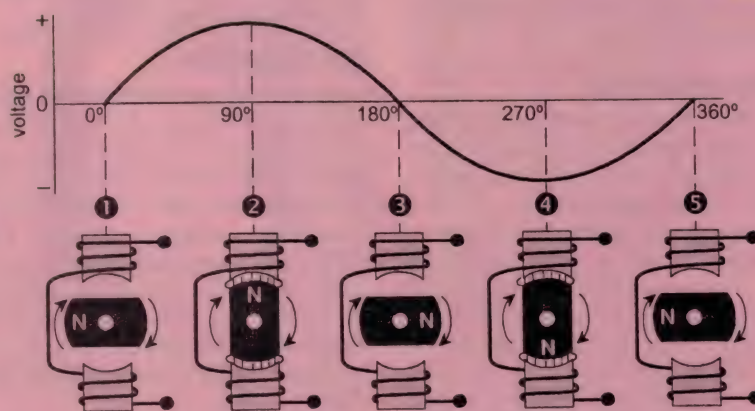


Fig.1

Fig.1: Generating a sine wave with a simple alternator.



details of their 2000 compliance strategy.

Unlisted companies are another story. However, the 1998 Federal budget includes making all work on 2000 compliance an immediate tax deduction. So if Australia makes enough effort, we'll be in a good position to pick up business over the next 18 months.

And that's where you and I can help. If you have an appliance that could be affected by the bug, contact the manufacturer and ask what the company is doing to fix it. If enough people do this, companies will need to respond. Unfortunately, some companies are claiming to be 2000 compliant already, even though they're not. But many are not even fully aware of the problem. Complacency is seen by many commentators as the main problem to overcome.

Going back to our June letter, while it's clear that large computer systems pose the biggest problem, virtually all appliances with an embedded microcontroller are at risk. The microcontroller might not have a date function, or if it does, it might not be used. But if this function is used (and you might be unaware of it), there's no guarantee the appliance will work after December 31, 1999. Solution: ask the manufacturer.

You can make a few simple checks with computer software to check its compliance. For a spreadsheet like Excel, type 01/01/00 into a cell. If the program is compliant, it will show the date in the data entry bar as 1/01/2000. My advice is to make as many checks as you can, and to ensure all new software you buy is stamped as being 2000 compliant.

Several people interviewed by the SBS program suggested it would be unwise to fly, ride in a lift, drive a car, or travel at all on New Year's Eve, December 1999. And after having spent many years writing software, I think this is good advice.

## Battery problems

Coming back to reader problems, our first letter concerns the loss in capacity of a car battery when used to supply a low current. I'll let our correspondent explain:

*I am trying to find information on using a car battery for purposes like camping or alarms. I have used them in the past, but have found that on a low current drain and with regular recharging, over a period the battery capacity diminishes quite remarkably. Do you have any information on preferred methods of cycling lead-acid cells to help maintain their capacity?* John Walsh, via the BBS)

The capacity of a lead-acid cell is affected by two main things, John: the strength of the electrolyte and how much the plates are sul-

phated. If a lead-acid cell is left in a discharged state for a few months, the plates become sulphated and the battery capacity is reduced considerably, often to a point where it's useless. The operational factors that cause these conditions include discharging the cell below 80% capacity, and overcharging. If you overcharge a cell, gas is liberated, reducing the water content of the electrolyte. If you discharge it below about 80% full capacity, sulphation occurs that cannot always be removed by recharging.

So what can you do about it? Unfortunately the problem is complicated by two factors: the type of lead-acid cell, and the use it's being put to. So all I can do is generalise. For more information I suggest you visit a technical library (try a TAFE college library) and borrow a book titled *Battery Reference Book* by T.R. Compton (2nd ed), ISBN 0 7506 2567 8. The relevant section is in part 45, which discusses charging lead-acid cells.

As you'll read, there are various ways of charging lead-acid cells, depending on the type of cell and its application. In general, charge the cell with a constant voltage, and make sure the initial charge current is not too high. The charging potential depends on the use and the battery construction. The initial charge current depends on the capacity of the cell and its construction.

You've made no mention of how you are charging your battery, John, so if you haven't already built one, I suggest you build a suitable charging regulator, such as the solar battery charger described in *EA* November-December 1994. You can use this regulator with any DC source, such as the alternator from your car. But you'll need to refer to the book I've mentioned for the optimal charging voltage and current.

## EM induction

In the May column I discussed the Pixii generator, along with a brief look at the relationship between a moving magnet and the polarity of the induced voltage in a coil near the magnet. This was in response to a letter from Kees Lindeman (Allambie Heights NSW), who wanted to know where the slots in the commutator should be in relation to the moving magnets. I said the switching should occur when the magnets are at their maximum distance from the coils. But not everyone agrees:

*Whoops! I think you owe Mr Lindeman an apology. Induced voltage is proportional to the rate of change of magnetic flux. Hence the voltage changes sign when the flux stops increasing and starts decreasing. That is, when the magnets are in line with the coils.*

(Philip Badham, Frenchs Forest, NSW)

The next letter also expresses disagreement, and is along similar lines to the above letter. I've condensed it, but you'll get the idea.

*I think Mr Lindeman is correct, in that switching should occur when the magnets face the coils. Since a current (or voltage) is induced in a conductor only when the conductor is moving, it follows that the amplitude of the current (or voltage) is proportional to the rate of change of flux, and not on the absolute value of the flux. Therefore, the current passes through zero when the conductor is nearest either pole, as the current changes from one polarity to another. I could be wrong, so I'd be very happy if you could set me straight.* (Herman Nacinovich, Gulgong, NSW)

And Kees is not convinced, either:

*A law of physics states the current in a coil will be such that it opposes any change in its magnetic field, or the current in a coil will be such that it attempts to maintain its magnetic field. When we have a coil with a meter connected to it and insert a pole of a bar magnet into the coil, the meter will deflect. When the magnet is removed, the meter will deflect in the opposite direction. When the magnet goes past a coil, I maintain the same thing happens. That is, the voltage changes polarity at this point.*

*Looking at your answer of polarity change at the point where the magnetic field changes direction, I maintain that as the changeover point of the magnetic field approaches the coil, the current will be such that it opposes the decreasing (say north) field. Just after the changeover point passes the coil, the current will be such that it opposes the increasing (now south) field. Please note the double whammy here — decreasing north and increasing south. Hence no polarity change.* (Kees Lindeman)

I guess the simplest way to approach this is with a diagram, shown in Fig.1. The mechanical arrangement shown in this diagram is different to the Pixii generator, but the principle is the same. When the magnet is away from the coils, the induced voltage is zero as there's no flux to cut the coils. As the magnet moves towards the coils, the induced voltage increases, peaking when the magnetic flux density cutting the coils is a maximum. The voltage changes polarity when the magnetic field changes polarity.

The rate of change of the flux is constant, unless we manage to vary the speed of rotation. The only things changing are the strength and polarity of the magnetic field. The polarity changeover must be at the zero voltage point, which happens when the magnetic flux is not cutting the



coils. This occurs when the magnets are furthest away from the coils, so commutation should be at this point.

It seems our readers are confusing rate of change of flux with a change in flux density. The equation to find the induced voltage in a coil is  $e = B/lv$ , where  $e$  is the induced voltage,  $B$  the flux density,  $l$  the length of the conductor, and  $v$  the relative velocity between the coil and the magnetic field. Reducing the flux density is not the same as reducing the relative velocity, even though they have the same effect on the induced voltage.

## Pixii generator

I feel vindicated by this next letter:

*There's a very nice photograph of a Pixii machine in a book called Collins Eyewitness, Science, printed 1992, ISBN 0 7322 0114 4. It clearly shows a rocking system of cam driven contacts to provide the commutator action.* (John Hill, email)

I'm very pleased to hear about this John, as all other books I've seen show a conventional commutator — which as I discussed in previous columns, is not what I saw in the Deutsches Museum. All we need now is to find out where the Pixii generator is that's described in the other books. And on the subject of the Pixii generator...

## TIG welder

I'm presenting this next letter in case a reader can help.

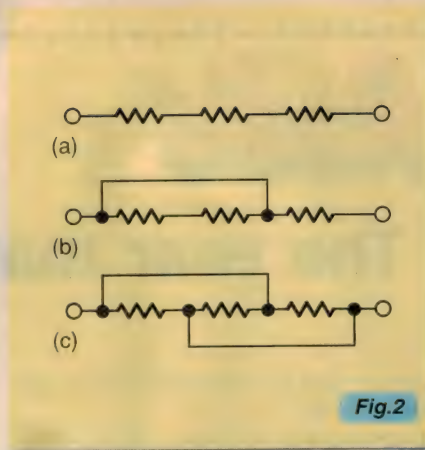
*I'm hoping you can help with some ideas for converting a DC-only TIG welder into a 'rough AC' machine, possibly using some large SCRs. This is so I can use the welder on aluminium, which needs AC to help break the oxide film. Some welders superimpose a 1kHz (I think) AC signal on the DC output, usually with a primitive spark gap device.*

*My welder operates from 240V and has a 160A DC output current. I propose a circuit with SCRs (as in an inverter drive for a motor), to derive a rough AC from the DC supply. But my limited knowledge is stopping me. If anyone can help, please contact me via the EA BBS, email on tyronesmith@one.net.au, or fax on (03) 9875 0512. (Tyrone Smith, BBS)*

As this is a rather specialised topic, I can't really help. It needs someone who has actually done what you are after Tyrone, as the experimental costs alone could be quite large. After all, you're talking 160 amps here!

## Static electricity

The next letter solves the problem of static electricity caused by nylon carpet. This topic was discussed some time ago, so I hope our original correspondent (Paul Vierkant) is reading this.



**Fig.2:** What's the resistance of each circuit? All resistors are 100 ohms.

*We were troubled with static electricity here, and I came across a product called Staticide Heavy Duty Solution #2005, distributed by Electronic Development Sales. When we first tried it, we expected it to last only a few months, but it lasted about four years before further treatment was needed. We have an air conditioned environment, with synthetic carpet and we wear normal synthetic clothing. A one litre bottle covers about 70 square metres. Thanks for an interesting column.* (Ian Johns, Dickson, ACT)

And thank you, Ian. Electronic Development Sales can be contacted on (02) 9418 6999.

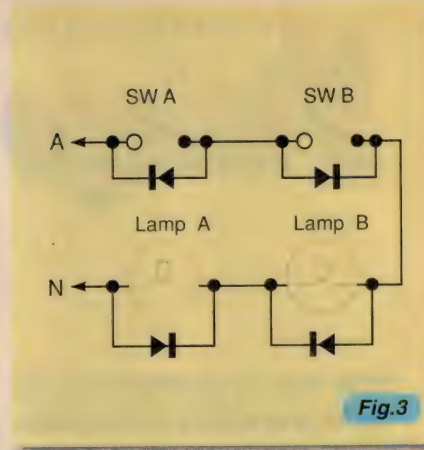
## Input resistance

I think this has become a topic I'm wishing I'd never started. Still, it makes for interesting discussion.

Last month I discussed some of our recent What?? questions, in particular the question about the input impedance of an op-amp circuit that was originally drawn incorrectly. The following letter is from one of our contributors to last month's discussion. I'm including it here, as the writer is concerned that the integrity of the magazine is being compromised by my analysis of the circuit.

*I think you've missed my point that resistance is not always defined by  $R = V/I$ . Furthermore, in arriving at the erroneous answer, the analysis you presented violates important principles and conventions of circuit analysis. It has nothing to do with the voltages being AC or DC.*

*Consider what happens if input A is slightly more than 1V. Your analysis suggests the input resistance is finite and positive. If this voltage is slightly less than 1V, the input resistance is still large, but negative. Thus your analysis suggests the input resistance is voltage dependent,*



**Fig.3:** The circuit diagram for the July What?? The diodes should ideally be fitted inside the lamp bases and inside the switches so no one sees them.

*which is nonsense. It also implies the circuit is non-linear, which means it will distort an AC signal, which is not true. The simple fact is there are some illegal moves in the analysis, and the conclusion invalid.* (Phil Denniss)

To get the full story, you'll need to read last month's column. I'm interested in what others have to say about this, as I've said what I wanted to last month. But be assured Phil, like you, I want this column to be as technically accurate as you, other readers and I can possibly make it.

And on a final note, 'Dr Henry Choke' has requested a few editorial changes to the text (sorry, it's too late) and asked me to stress that the alternative circuit presented by Jim Thornton doesn't solve anything...

## What??

This month's question is not difficult, but it should cause a bit of head scratching nonetheless. It comes from Paul Coxwell, of Norwich in England.

*Three resistors, each with a value of 100 ohms, are connected in series as shown in Fig.2(a). A jumper is then connected across two of the resistors, as in (b). A second jumper is now connected giving the arrangement shown in (c). What is the resistance of each circuit?*

## Answer to July's What

The circuit is shown in Fig.3. Notice the inclusion of the diodes, which according to Martin Gardner should be (if you build the circuit) mounted inside each switch and in the base of the lamps, not the lamp sockets. Otherwise you can't swap the lamps around. You could have a lot of fun with this by building it on a board, and showing disbelievers there's nothing underneath. ♦



# Vintage Radio

## The year that was — 1926

**1926 was an exciting year for radio, especially in Australia. There were innovations on the technical side, but probably more dramatic were the changes in the way 'wireless' was being seen by the average person. Broadcasting had also become a fully-fledged industry, and various snippets of information suggest that within the media industry, 'there is nothing new under the sun'...**

**F**irst, let's look at the radios themselves. In appearance, circuits and loudspeakers there was not a lot of dramatic change from the previous year, although of course there were changes.

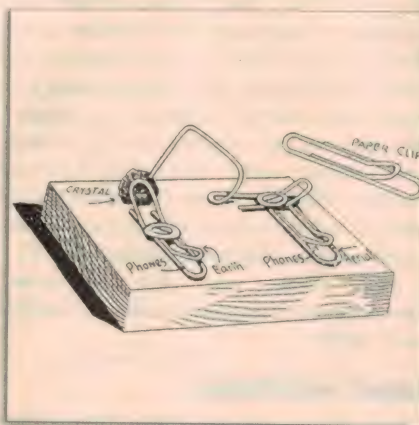
The one thing that can be said for 1926 is that there were some conventional circuits being adapted into novel 'sets'. One such circuit, described in *South Australian Wireless and Radio Weekly* for August 18th, was 'A crystal set for 7d' (six cents). The circuit, if you can call it that, is shown in Fig.1. Actually it is a bit of a ruse, because there is no tuning circuit save the length of the aerial wire, and station 5DN with its modest 300 watts, could only be heard when 5CL (with 5000 watts) was off the air!

The article went on to add that the 'chap who requires maximum selectivity out of a set

that costs him 7d to 2/6 (25 cents) is very hard to please'.

Another radio described for a specialist location was described in *Wireless Weekly* for October 8th. It was dubbed the 'Flat-Dwellers Receiver' and was unusual in that the accompanying photo showed a woman working the controls. The very idea!

Actually, this photo provides rather an interesting commentary. Firstly, there is recognition that people in flats are unlikely to be



**Fig.1: The seven-penny Crystal Set. It's more of a gimmick than a radio, of course.**

able to construct large outside antennas; secondly, there is recognition (grudgingly?) that women can actually operate a radio and thirdly, that women live in flats. The sociologists may muse upon this at their leisure.

The circuit for the flat dweller's four is shown in Fig.2. As can be seen, it operates from a loop antenna, and regeneration is curiously applied via inductive coupling from the untuned RF transformer to the secondary. The secondary is then fed back into the cold end of the only tuned circuit. It appears that this was done in order to eliminate one of the controls, thereby to simplify its operation.

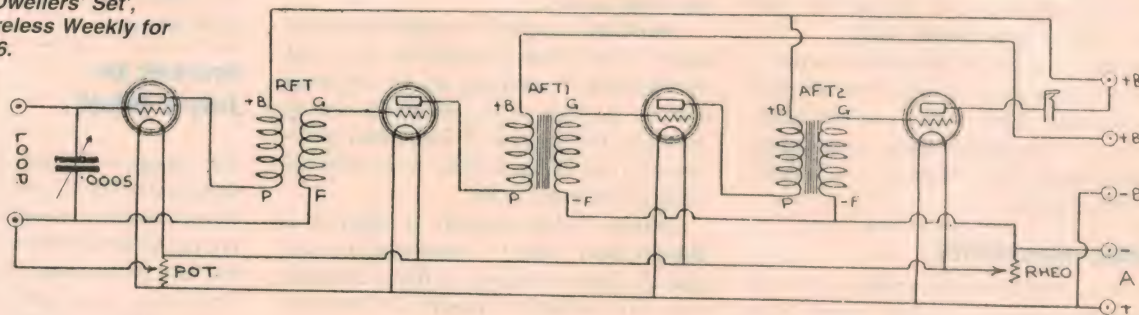
Having studied this circuit, one wonders how it actually works. How is detection achieved? There were no clues in the text. It could not have been anode bend detection, because the bias would be quite incorrect for the second valve.

Actually, it's grid leak detection. The grid capacitor in parallel with the resistor are shown in the wiring diagram and the photo. It seems that the draughtsman left them out of the circuit!

### Neutrodyne

Probably the most salient circuit promotion of 1926 was that for the neutrodyne. There was a very good reason for this. By 1926 there were quite a few radio stations on the air. There was 2FC, 2BL, 2KY, 2GB, 2UE, 2UW, 3LO, 3AR (possibly 3DB and 3UZ as well), 4QG, 5CL, 5DN, 5KA, 6WF (with other 'B' class stations?) 7ZL and the four broadcasting stations of Radio Broadcasting Co of New Zealand. The New Zealanders were easily receivable on the eastern seaboard. With the high, long wire antennas still being advocated for sets of the day, typically 30 feet high and 60 feet long, reception

**Fig.2: The 'Flat Dwellers' Set', presented in *Wireless Weekly* for October 8th 1926.**







**Fig.5: A selection of speakers released in 1926. From left to right they are an Amplion Radiolux, an Amplion AR38 and a Brown H2.**

with only a single tuned circuit was now becoming a problem.

The usual trick had been a 'three coil tuner', by which the aerial coil and reaction coils could be variably coupled to the tuning coil. However this was proving inadequate. The



**Fig.3: Remarkably, this 'Radiokes' coil kit has survived untouched for over 70 years. The third coil is still in its wrapping paper inside the box!**

answer was to improve selectivity, by one or more tuned RF stages.

Unfortunately, it is a fact of life that the valves of the day — triodes — did not make good RF amplifiers. They tended to become tuned grid-tuned plate oscillators. One answer was to 'neutralise' the stage. This involved feeding a small amount of signal from the anode, 180° out of phase with the incoming signal, back to the grid circuit of the valve.

The means by which this was done was via a very small value adjustable capacitor, equal to the grid-plate capacitance so that it would cancel out or 'neutralise' the actual grid-plate capacitance of the valve and effectively stop the valve from oscillating. The small

capacitor, about the size of a postage stamp, was called a 'neutralising capacitor'. There were several methods of achieving this, and 'neutrodyne' almost deserve an article of their own. Once the stage was neutralised, it was much easier to control.

However in 1926, such sets were still three-diallers with filament rheostats, and care and experience were needed to drive them. Despite this, they seemed to work quite well, with many readers claiming good results. To this day such a set of 1926 vintage and using the original valve types can still separate the AM band stations.

A brand new-in-box set of 'Radiokes' brand neutrodyne coils is shown in Fig.3. Because of the difficulties involved, component parts manufacturers began offering them as a complete set, as the advertisement from WW for September 3rd indicates (Fig.4.)

### Valves & valve prices

Perusing the literature of the day reveals that type 201-A's started the year at 17/6d (\$1.75) and finished, depending upon the brand chosen, for as little as 6/6d (65 cents). Philips B406's went from 17/6d to 13/6d (\$1.75 to \$1.35) and Philips bright emitters, types D2 and D3 were being offered for as little as 2/- (20 cents). Of course their real value would be much higher in today's money.

Other valves released during the year were the Mullard PM3 and PM4, PM5 and PM6, PM2, PM1HF and PM1LF, as well as newer Cossor types. Osram released their DEL and DEP series. 'GeCo', 'Radex' and 'Radiotechnique' all produced a valve which had remarkable similarities to the 201-A and 199!

Among the newer types released in 1926

were the types 112, 210, 171, 250 and 120. Although the type 226 was supposedly released in 1926, there was no mention of it in the material available for research of this article. The big departure here is the release of the 171, 250 and 210, which are directly heated valves suitable for AC supply.

### Other equipment

Radios were definitely coming down in price. The top-of-the-range models such as the Gilfillan Neutrodyne were being offered complete with all accessories for £59/17/9 (\$119.78). However Farmers Stores, Mick Simmons Limited and Colville-Moore Wireless Supplies, with no doubt Melbourne firms such as Harringtons, Lewis Coen and Hartleys as well, were offering two valve sets complete from about £16/- (\$32). David Jones were offering their two valve set 'complete', but not including speaker for £12/- (\$24).

It is still interesting to note that when a radio was advertised, valves, batteries and speaker were regarded as 'accessories'! (Which seems like offering a car with the wheels as optional extras...)

The Brandes 'Table Talker' speaker started the year at 63/- (\$6.30) and ended the year at 45/- (\$4.50). A Western Electric loudspeaker was being offered for as low as 25/- (\$2.50).

Amongst the more highly priced speakers was the 'Radiolux Amplion' shown in Fig.5, with a fairly consistent asking price of £11/- (\$22). The other two horn speak-

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# Vintage Radio



ers shown in the same photo are the Brown H2 and an Amplion AR38 at £3/-/-.

Of considerable interest is that battery chargers and 'B' battery eliminators went on sale with Balkite, Homecharger and Philips offering a version of each.

1926 saw the introduction of the cone speaker. Sferavox, Magnavox and Crosley Musicone were the most prominent, with Amplion introducing some of their range towards the end of the year. Another important piece of equipment which had a distinguished career and was introduced in 1926 was the Ferranti interstage and output transformers. There were none like them, and they were by far the best audio transformers available at the time.

The locally produced Radiola IVB and IVC went on sale in 1926, marking the introduction of a dynasty of domestic production.

A departure from mere set construction was an article in *Wireless Weekly* for April 9th in which was described a 'useful instrument for the B.C. listener or experimenter'. There is no circuit as such, rather a wiring diagram. The instrument can be used as a wavemeter, a crystal set, a wave trap and an absorption meter. The various connections are described in the text, and of course there is the customary column space devoted to building the box — plus a lesson on French Polishing!

## Other changes

Apart from the neutrodyne, the advances in 'radio' were more sociological than technical. Radio was now an industry in every sense of the word, and we can see the genesis of many aspects of modern day media plays.

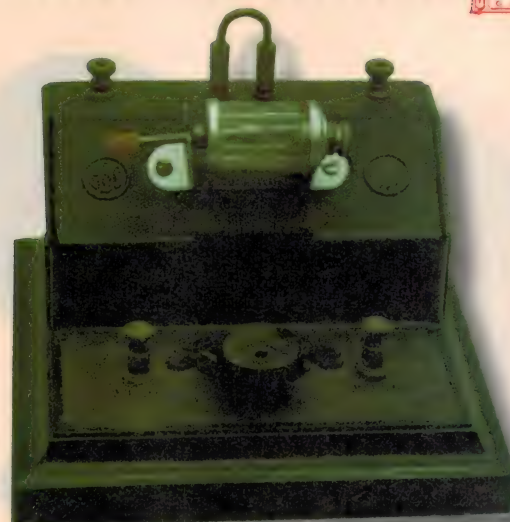
*Wireless Weekly* itself became far more professional in its appearance and content. By about mid-year, it had increased in size to about A4 size and 56 pages, not including the cover. As well as the technical articles and the run of advertised products, it contained an informative and sometimes quite witty editorial, together with quite lucid accounts of games of contract bridge played during a radio tournament, and some rather interesting travelogues about how radio saved the day when so-and-so was on his trip to the Spice Islands and the South Seas. It really is stuff straight out of *Boys' Own*!

The descriptions of the games of contract bridge are very good indeed, and some of the bids and plays were clever. Obviously they were players of a high calibre.

Amongst other topics which may raise an eyebrow were 'Women's influence on radio'. Talk about patronising; the feminists would have a field day!

Such was the perceived popularity of

Fig.6: One of the commercially made crystal sets of 1926, the Brownie No.2.



radio that throughout the year there were several articles in the popular journals about operating costs of radios. Such articles contained the various economies of battery care, battery consumption, valve types and choosing value for money. There were sets described that were heralded as being cheap to build, but with satisfactory results. Therein begins a trend which has endured.

In a rather witty editorial in *WW* for 10th September, is written *Our aim is to place a copy of 'Wireless Weekly' in the hands of every listener-in.* For those unfamiliar with radio magazines of the 1920's, *Listener In* was a Melbourne-based magazine in direct competition to *Wireless Weekly*!

The New

## Radiokes

**COIL KIT**

For Use in the Famous  
**Neutrodyne Circuit**



The Coils you will eventually buy  
At all leading Radio Dealers.

**32/6 per set**

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27-9 King Street, SYDNEY.

Late  
Keith Stokes Pty., Ltd.

Fig.4: Advertisements for Radiokes coils in *Wireless Weekly* for September 3, 1926.

## Nothing new...

Finally we come to realise that there is considerable *deja-vu* within the electronic entertainment industry of today. In 1926, we see the emergence and the promotion of 'personalities'. These individuals are sometimes given copious column space, and were given front page billing.

Then we have the rather sumptuous prizes, worth over £500 (the price of a Buick car) for a bride who was willing to be married and have the ceremony broadcast live. Now where have we seen that before? Another promotion with lavish prizes was the 'Miss 3LO' competition; and so forth...

The editorial referred to above was referring to a prize to Java on a Burns Philp steamer, with spending money, for the person who could enlist the most new subscribers to *Wireless Weekly* (Are you listening, Mr Rowe?) This is another example of subscriptions promotion with prizes, which has endured to this day.

In summary, 1926 can be summarised as a milestone year in radio, but more for its sociological advances than the technical developments.

## Society benefits

Before closing this month, I'd like to suggest that if you're really interested in vintage radio, you consider joining the Historical Radio Society of Australia (HRSA). Membership will cost you only \$20 per year, and brings many benefits to anyone with an interest in the subject — not the least of which is a well presented quarterly publication, which carries many helpful classified advertisements.

If you'd like to join the HRSA, which I can recommend, you can contact them via PO Box 2283, Mount Waverley 3149. ♦



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For more details on the Analog Devices DSP Family see <http://www.analog.com>

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DSP  
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*Electronics Australia is one of the longest-running technical magazines in the world. We started as Wireless Weekly in August 1922 and became Radio and Hobbies in Australia in April 1939. The title was changed to Radio, Television and Hobbies in February 1955 and finally, to Electronics Australia in April 1965. Here's some interesting items from past issues:*

## 50 years ago

### August 1948

**A New Valve:** A new kind of radio set, whose music began instantly when the power was turned on, was shown last month by the Bell Telephone Laboratories. The set has no vacuum tubes; nothing lights, nothing even glows, and nothing gets warm — so the usual warming up of tubes does not exist.

The invention that replaces tubes is a tiny metal cylinder in which there is no vacuum, no grid, no plate and no glass to keep the air away. The entire innards are merely two hair-thin wires that run down to the base of an empty tube, to stand on a bit of metal not much larger than the head of a pin. This piece of metal is the secret: it amplifies the current that one wire carries to it, and the other wire carries away the amplified current.

The power used was less than that of an ordinary flashlight battery. The new tube is called a transistor; it is not on the market.

Laboratory scientists said the tube is also a good oscillator; that is, it will generate and send radio waves. They expect it to do many things that vacuum tubes do, and some that the vacuum tube cannot. The inventors are Drs John Bardeen and Walter H. Brattain, working under the direction of Dr William Shockley.

## 25 years ago

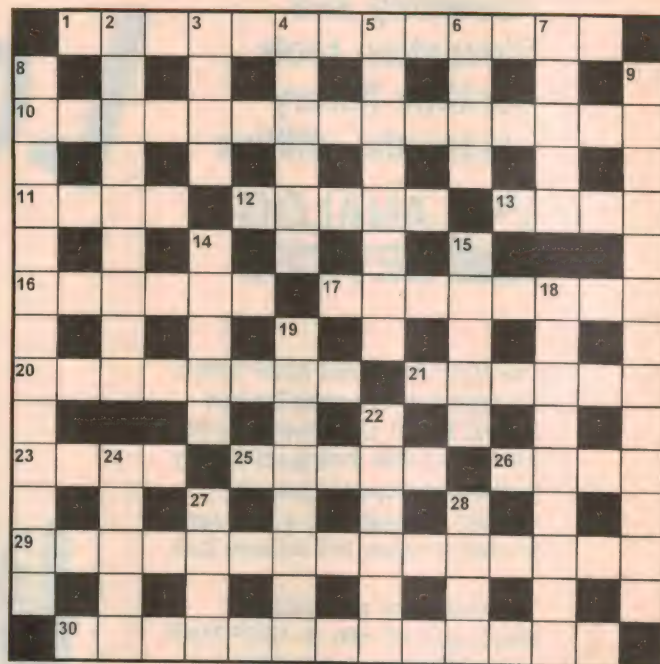
### August 1973

**AWA to Develop INTERSCAN System:** The development contract for an evaluation version of the new CSIRO-developed microwave landing system for aircraft, INTERSCAN, has been placed by the Department of Civil Aviation with Amalgamated Wireless (Australasia) Ltd. The equipment, which will be developed from the concepts and with the guidance of the Department of Civil Aviation and CSIRO, will be installed during 1974 at an Australian airport and evaluated by DCA, which will compile a final report for consideration by the International Civil Aviation Organisation (ICAO).

**Australia to get 'Radio Shack' stores:** It looks as if there's some good news for local electronics and hi-fi fans: the big US Tandy Corporation has announced plans to set up a chain of its well-known 'Radio Shack' stores in Australia.

With over 2400 stores spread throughout all 50 states of the USA, Tandy Corporation is the largest chain of electronics and hi-fi stores in that country — possibly in the world. They are currently expanding into both Europe and the UK, in addition to the Pacific area. The ultimate plan is to establish about 100 stores in Australia, according to Senior Vice-President Mr Dean Lawrence, who is responsible for the Pacific operation. ♦

# Crossword



### Across

- 1 Illumination produced by a current. (8,5)
- 10 Adjustment for compensated volume. (8,7)
- 11 Make a facsimile. (4)
- 12 Gas used in electric lamps. (5)
- 13 Single sideband suppressed carrier. (1,1,1,1)
- 16 Element 88 — not a welcome glow. (6)
- 17 Making use of memory. (8)
- 20 Structure of the mobile phone network. (8)
- 21 Community communicator: the .... telephone. (6)
- 23 First to locate the North magnetic pole. (4)
- 25 Flat conductor. (5)
- 26 Begin to make use of a telephone. (4)
- 29 Word describing basis of loudspeakers. (15)
- 30 Protective enclosure. (8,5)
- 6 Charged particles. (4)
- 7 Some speakers have them attached. (5)
- 8 Laundry appliance. (8,5)
- 9 Timepiece, generally quite reliable. (8,5)
- 14 Sequence of data awaiting execution. (5)
- 15 Another showing of a movie, etc. (5)
- 18 Word describing a type of galvanometer. (9)
- 19 Unit of electric energy. (4-4)
- 22 Pertaining to element 20. (6)
- 24 Discoverer of famous refractive law. (5)
- 27 Concerned with organ of hearing. (4)
- 28 Safety device — substitutes are unwise. (4) ♦

### Down

- 2 Foot control on piano (or sports car?). (4,5)
- 3 Prefix meaning motion. (4)
- 4 Lines on TV or monitor screen. (6)
- 5 Major meteorological events. (8)

### July's solution:

V	O	L	T	M	E	T	E	R	R	E	S	E	T
O	I	U	H	E	E	O	A						
S	Y	S	T	O	L	E	T	I	E	C	L	I	P
T	T	N	O	R	L	A	E						
O	V	E	R	O	R	I	O	N	G	R	I	D	
K	N	T	Y	F	S	E							
	P	I	X	E	L	D	I	A	T	O	M	I	C
O	N	M	E	T	R	E	K						
H	I	G	H	P	A	S	S	G	A	U	S	S	
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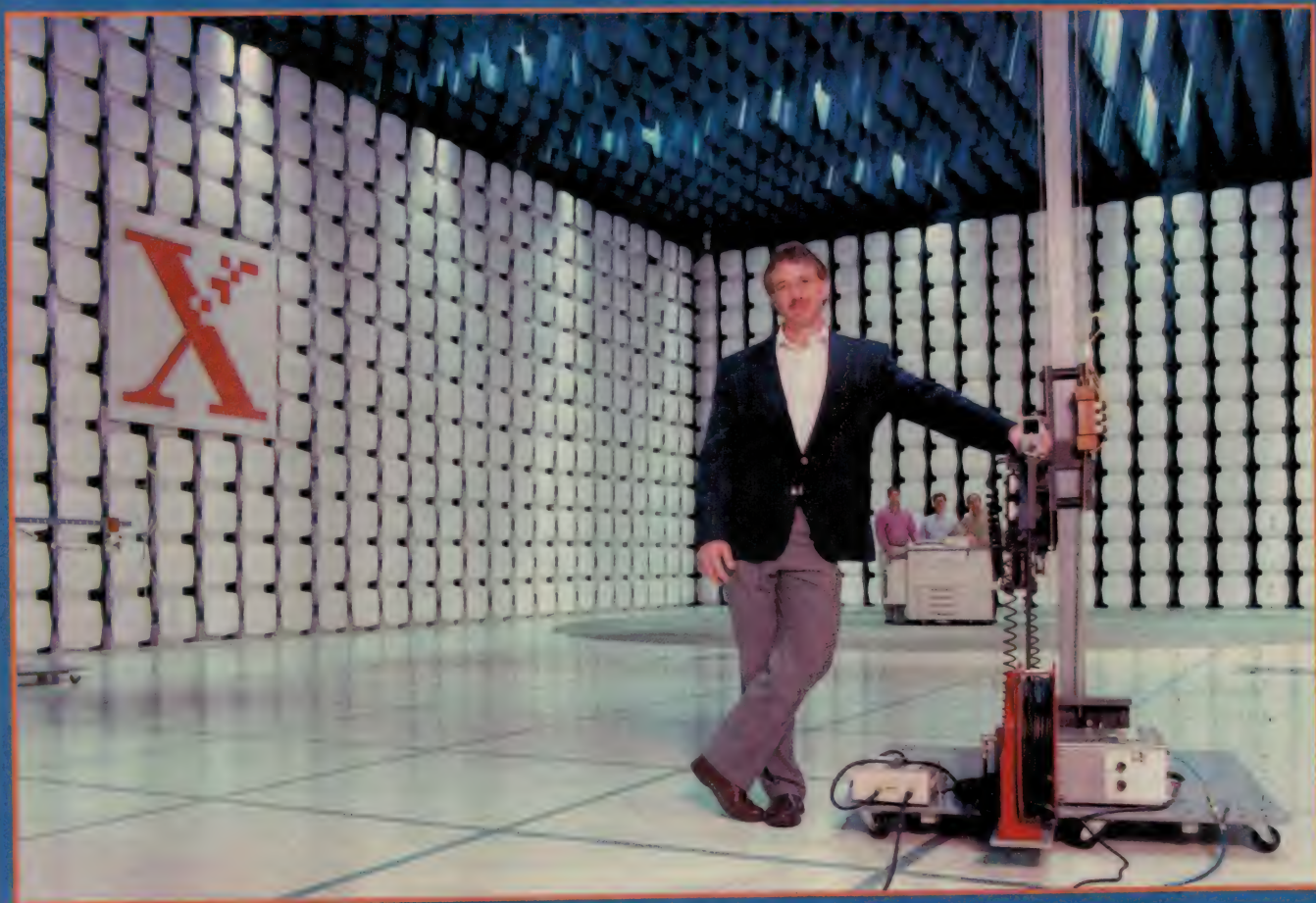
# Electronics Australia's **Professional Electronics**

Bell Labs & Yale scientists  
develop 'bowtie' microlasers  
with 1000 times the optical  
output of previous types

Review of Adobe Acrobat  
V3.0: converting your  
documents into PDF form

Printers Feature:  
How new-generation inkjets  
deliver photographic quality

AMD's new K6-2 processor



**Largest anechoic chamber in the western hemisphere:**

Xerox Corporation's new chamber in Rochester, New York is twice as large as an average three-bedroom house, with instruments designed for EMC testing of consumer & office equipment...



# Highlights News

## Scientists develop tiny 'bow tie' lasers

Using chaos theory, a team of scientists from Lucent Technologies' Bell Labs, Yale University and the Max Planck Institute of Physics in Germany have demonstrated novel semiconductor microlasers that use 'bow ties' of laser light to emit highly directional beams with more than 1000 times the power of conventional, disk-shaped microlasers. The experimental microlasers — so small that hundreds would fit on the head of a pin — are cylindrical and have potential for unique beam-steering capabilities.

"This is a remarkable advance", said Cherry Murray, director of the Bell Labs Physical Research Lab. "These lasers offer promise as small, efficient light sources over a broad range of the light spectrum, from the mid-infrared to the visible. Possible future applications are in optical local-area networks and optical data processing."

The lasers, which emit light in specific directions, operate in a lasing mode in which light travels in a path that forms a bow-tie pattern, rather than operating in the 'whispering-gallery' mode of circular microlasers.

The whispering-gallery mode is named after the sound effect noted in some cathedrals, where one can whisper along the wall and be heard all along the inside perimeter of the dome. Like whispers in such buildings, light pulses travel around the edge of the disk laser. Such lasers have two drawbacks, however. First, due to excessive internal reflection, they emit only a few microwatts of optical power. Second, the direction of the emitted light is not well defined.

The researchers discovered that suitably deforming the disk allows the light to bounce at slightly different angles, in a chaotic path, until it escapes. They also learned that, above a critical deformation level, the light pulses will travel in a bow-tie pattern, which suffers less internal reflection and emits light in four narrow, controllable beams. Each beam has an output of 10 milliwatts of power, which increases the laser's total output to 40mW. The high-power microlasers offer many advantages for future applications in optical interconnects and high-density optical circuits.



*Members of the 'bowtie' laser development team: scientists (standing, L to R) Debbie Sivco, Federico Capasso and Claire Gmachl of Bell Labs, and (seated, again L to R) Evgenii Narimanov and A. Douglas Stone of Yale University, posing for a celebratory photo — with bow ties, of course.*

Lasers are used in optical-networking systems, which carry telephone conversations, video, Internet traffic and other data as beams of laser light through glass fibres. Lucent Technologies introduced the world's first commercial optical-networking system in 1995 and this year unveiled its WaveStar 400G system, which delivers a record-breaking 400Bb/s (billion bits per second) over a single fibre.

The microlaser research team includes Federico Capasso, Claire Gmachl, Deborah Sivco and Alfred Cho, of Bell Labs; Jerome Faist, formerly of Bell Labs, now with the Universite de Neuchatel in Switzerland; Evgenii Narimanov and A. Douglas Stone, of Yale; and Jens U. Nockel of the Max-Planck-Institute.

Capasso, head of the Semiconductor Physics Research department, called the physics behind the new microlaser "very exciting", adding "It combines fundamental quantum-chaos physics with the latest advances in semiconductor laser technology."

The new device is the latest in a long line of laser innovations from Bell Labs, where 40 years ago Arthur Schawlow and Charles Townes described the concept and design for the laser — one of the century's greatest inventions. Semiconductor lasers are now the most widely used and versatile class of lasers.

Bell Labs scientists have made many contributions to laser technology, including Capasso and Faist's 1994 invention of the quantum-cascade (QC) laser, a fundamentally new type of laser that operates like an

electronic waterfall. The microlaser demonstrated by Bell Labs and Yale is a modified QC laser, though the technique may also be used with conventional semiconductor lasers used in communications.

There have been many attempts to improve semiconductor laser resonator properties. Increased reflectivity of the resonator mirrors is highly desirable because it allows low thresholds for the onset of laser action. Reduced volume of active material also reduces energy requirements and drive currents, and makes it possible to pack more lasers in a small space.

An important step in this direction was the development of microdisk semiconductor lasers, which exploit total internal reflection of light to achieve superior mirror reflectivity. These lasers — the smallest in the world — were invented and first demonstrated in 1991 by Sam McCall, Richard Slusher, and colleagues at Bell Labs. Micro-disk, -cylinder or -droplet lasers form a class of lasers based on circularly symmetric resonators, which lase in 'whispering-gallery modes' of the electromagnetic field.

In such a mode, light circulates around the curved inner boundary of the resonator, reflecting from the walls of the resonator with an angle of incidence always larger than the critical angle for total internal reflection, thus remaining trapped inside. There are only minute losses of light due to evanescent leakage, or tunnelling, and scattering from surface roughness.

The tiny 'whispering-gallery' type lasers,



however, lack high output power and directional emission due to the high reflectivity boundaries and the circular symmetry. The experimental microlasers of the Bell Labs and Yale team overcome these limitations. They are based on a new optical resonator shaped as a deformed cylinder and are highly directional. Exploiting the concept of asymmetric resonant cavities introduced by Nockel and Stone at Yale in 1997, in which light undergoes chaotic ray motion, they offer more than 1000 times the power of symmetrical semiconductor lasers.

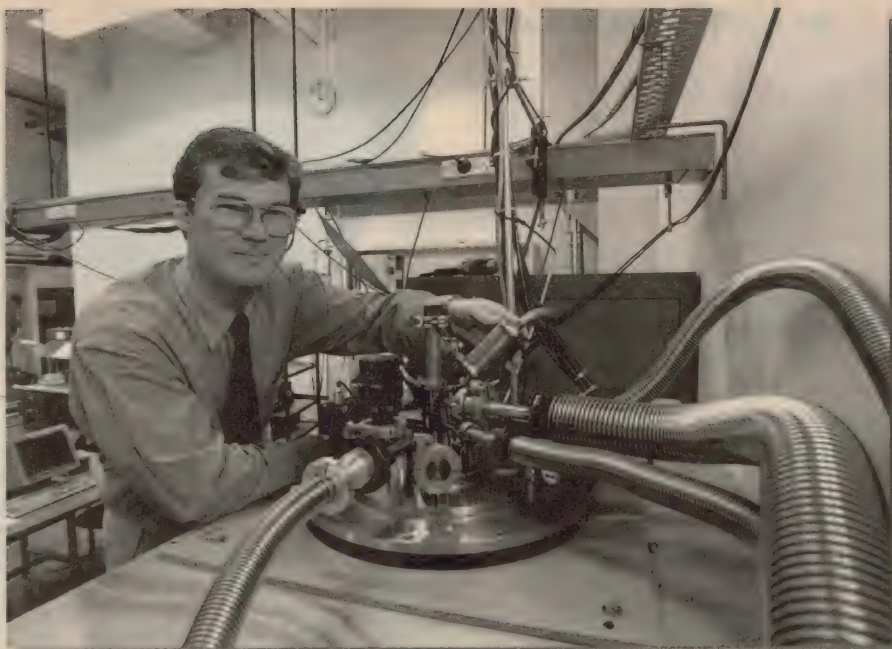
### Silicon-based quantum computer proposed by UNSW scientists

Quantum computers — computers so powerful they would make the latest PC look like an abacus — have been the Holy Grail of physical science since the 1980s. Scientists know the concept is feasible, but have never come close to actually putting it into practice. Now Dr Bruce Kane, a Research Associate in the University of NSW School of Physics, has issued a proposal, published in *Nature*, for creating a quantum computer using existing technology: solid-state silicon devices which are the mainstay of conventional computer technology.

The proposal has already attracted interest from Intel Corporation, manufacturers of the Pentium computer processor.

"Most proposals for implementing a quantum computer have relied on exotic physical systems that will be extraordinarily difficult to turn into a practical machine", said Dr Kane. "My proposal suggests it may be possible to create a quantum computer of enormous power using the technology developed to make conventional computers."

Dr Kane's idea is to create a quantum computer which could exceed the combined power of all the world's computers and would fit comfortably on the end of a single human hair. In what is a major Australian technological undertaking, the Director of



Dr Bruce Kane in UNSW's Semiconductor Nanofabrication Facility.

UNSW's Semiconductor Nanofabrication Facility, Professor Robert Clark, and Drs Andrew Dzurak, Neale McAlpine, Nancy Lumpkin, from the School of Physics, and Drs Eric Gauja, Christiana Honsberg and Mark Gross, from the School of Electrical Engineering, are also working on the project, along with postgraduate students Geoff Facer, Jeremy O'Brien and David Reilly. Undergraduate electrical engineering student Duraid Madina also worked on the project.

The UNSW group will be collaborating with researchers at the University of Queensland on the theory of quantum computation, with the University of Newcastle on the fundamental science of atom placement onto silicon surfaces and internationally with the Center for Quantized Electronic Structures at the University of California at Santa Barbara, USA.

It will also use UNSW's Electron Microscope Unit and the Key Centre for

Microscopy at Sydney University to analyse the atomscale devices it will be fabricating.

The group gave a detailed presentation on the proposal to Intel in the USA earlier this year and it is understood that a collaboration between Intel and UNSW is imminent.

The reason that nobody has been able to build a quantum computer yet, Dr Kane said, was that quantum information is extremely delicate and quantum computers are very susceptible to making mistakes. His proposed design involves placing phosphorus atoms into extremely pure silicon crystals in a very precise pattern. Quantum information is stored on the phosphorus atoms and is manipulated and read with the help of metallic pads near the surface of the silicon crystals. The phosphorus creates a centre which is ideal for quantum computation and at the same time is resilient against errors.

The UNSW Semiconductor Nanofabrication Facility, jointly run by the Schools of Physics and Electrical Engineering, will begin to produce the required elements for such a device in the next couple of years, with the help of a major University Capital Grant and ARC funding for the specialised scanned-probe equipment needed to fabricate the nanoscale phosphorus arrays.

"The implications of building a quantum computer are tremendous. The device could easily break modern encryption codes and so would compromise the secrecy of virtually all publicly transmitted data," Dr Kane said.

"Quantum computers are not always faster than conventional computers. They are no faster at multiplication, for example. But they are particularly good at exhaustive searches and encryption and so have a definite application in the future."

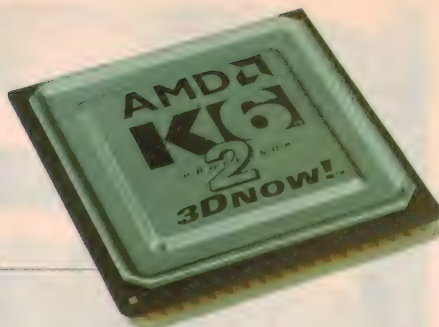
### US encryption talks fail again

Top US high-tech industry executives and government leaders have once again failed to reach a compromise on a policy that would let the country's companies export products that would let their foreign customers encrypt information.

"There wasn't an agreement to change any position", said Microsoft's Bill Gates, who had attended the two-day Washington DC summit along with US Attorney General Janet Reno, FBI Director Louis Freeh and dozens of industry leaders and Senators.

During the past year, the debate on easing encryption export licences has intensified dramatically and is now being fought at the highest levels in industry and government. "This encryption thing is turning out to be a real crisis. It's killing the American industry", said Eric Schmidt, chairman of Novell, who had joined Gates, Netscape chief Bob Barksdale, Oracle chairman Larry Ellison and other industry leaders during the conference sponsored by the Business Software Alliance, a group representing high-tech companies.





## AMD introduces AMD-K6-2 with 3DNow! technology

AMD has introduced the AMD-K6-2 processor, a Microsoft Windows compatible x86 microprocessor featuring the company's 3DNow! technology. The processor combines 3DNow! instructions and superscalar MMX capability, to deliver lifelike images and graphics, big-screen sound and video, and an enhanced Internet experience.

"For the first time, AMD has introduced a processor that is differentiated not solely by megahertz or price, but by innovative technology that delivers a new level of 3D performance and realism", said S. Atiq Raza, AMD executive VP and chief technical officer. "The AMD-K6-2 enables a new generation of high-performance desktop systems that advance the state of the art in 3D and multimedia computing."

PC makers worldwide, including IBM and Fujitsu, have indicated their intention to use the AMD-K6-2 processor with 3DNow! technology in forthcoming systems. AMD-K6-2 based systems are available now in thousands of retail outlets worldwide.

3DNow! technology is claimed as the first innovation to the x86 processor architecture that significantly enhances 3D graphics, multimedia, and other floating point-intensive PC applications to enable the emerging 'realistic computing platform'. 3DNow! is a set of 21 new instructions that use SIMD (Single Instruction Multiple Data) and other performance enhancements to open the performance bottleneck in the 3D graphics pipeline between the host CPU and the 3D graphics accelerator card. The technology accelerates the front-end physics and geometry functions of the 3D graphics pipeline to enable full performance of 3D graphics accelerators.

With its SIMD-style instructions and dual register execution pipelines, the AMD-K6-2

processor can deliver up to four floating point results per clock cycle. The AMD-K6-2/333 has a peak floating point performance of 1.333 gigaflops, significantly greater than the 0.333GFLOPs peak performance of a Pentium II 333, or the 0.4GFLOPs peak performance of a Pentium II 400. The AMD-K6-2/300 has a peak floating point performance of 1.2GFLOPs, or four times the 3D processing power of a Pentium II 300, rated at peak performance of 0.3GFLOPs.

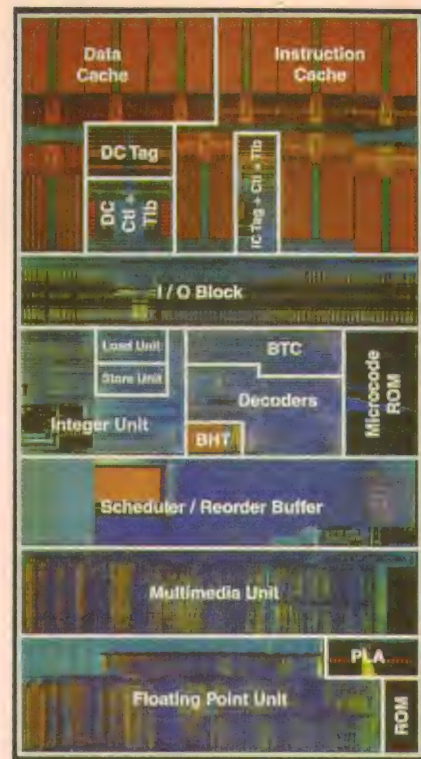
AMD says that 3D graphics drivers optimized for 3DNow! technology will soon be available for the Nvidia Riva 128, 3Dfx Voodoo2, ATI Rage Pro, and Matrox G-series graphics accelerators.

The AMD-K6-2 processor supports the 100MHz bus specification of the Super7 platform. The 100MHz local bus interface speeds up access to the level 2 (L2) cache and main memory by 50% over the 66MHz Socket 7 bus interface, resulting in a maximum bus bandwidth of 800MB/s an increase in system performance of as much as two processor speed grades.

"Because of the new 3DNow! instruction set and 100MHz Super7 bus support, the AMD-K6-2 delivers much greater performance than is possible from a simple megahertz improvement", added Raza. "It's truly a step change in 3D performance, providing better overall performance and significantly better 3D performance than Pentium II."

## Qualcomm bringing CDMA to Australia

San Diego based digital wireless pioneer Qualcomm Incorporated has announced that through OzPhone (a company formed to participate in Australia's Personal Communications Services auctions), it has



acquired eight 800MHz licences, covering 5.4 million potential customers (POPs). Qualcomm, as sole owner of OzPhone stock, plans to use the licenses to provide digital mobile and wireless local loop (WLL) services in several major metropolitan and suburban areas of Australia.

Qualcomm will deploy cellular systems based on the Company's Code Division Multiple Access (CDMA) technology, which offers secure, clear voice communications and fast, reliable access to data services, including e-mail, fax and Internet browsing.

"The government's decision to require the conversion from AMPS to digital in the cellular band in these areas will, for the first time, give Australians the opportunity to use CDMA, with its superior coverage, cost and quality, for wireless service in the cellular spectrum," said Harvey White, president of Qualcomm. "We are looking forward to bringing high-quality fixed and mobile wireless voice and data services to major portions of the country. We believe our CDMA network will bring fixed and mobile users a new level of freedom to communicate anywhere, anytime in a cost-effective manner in these greater metropolitan areas."

The consortium has acquired a total of eight 5MHz licences in the 800MHz band in the Brisbane, Perth, Cairns, Mackay, Maryborough, Grafton, Tasmania and Regional West regions, covering 5.4 million POPs. The total cost of the licences was just under A\$10 million.

CDMA, developed by Qualcomm, is claimed ideal for covering diverse terrain. ♦

## IN BRIEF

- Californian flash data storage specialist SanDisk Corporation has signed an agreement with Sydney-based **Advanced Portable Technologies** to distribute its flash memory products exclusively in Australia. For further information contact Felix Wong or Peter Maurer at APT, on (02) 9433 8300 or 1300 300 213.
- The UNIX and Open Systems Users Group Inc. (AUUG) will be holding its winter conference and exhibition **AUUG 98** at the Sydney Hilton Hotel between September 16 - 18. The theme this year is 'Open Systems: The Common Thread'. The conference will be preceded by two days of tutorials, on September 14 - 15. For more information contact AUUG at [auug98@auug.org.au](mailto:auug98@auug.org.au) or [www.auug.org.au](http://www.auug.org.au).
- The **Audio Engineering Society** will be holding its 105th AES Convention at Moscone Convention Center in San Francisco, California on September 26-29. ♦



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An invitation to the

# Electronic Forefront



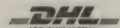
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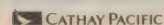
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There is no better place to obtain the latest on electronics than Hong Kong Electronics Fair '98. Over 1,200 exhibitors will be there to show consumer electronics, electronic components and technology. In addition, there are numerous concurrent events to satisfy buyers' needs:

- **"The Frontiers of Brainpower"** – for innovative concepts, prototypes of technology and product research with ample opportunities for business partnerships
- **"electronicAsia"** – jointly organized with Germany's Messe München International (MMI), for electronic components, assemblies and production gear
- **"LaserAsia"** – a Asian trade fair for laser technology and technical optics, co-organized with MMI
- **"Asian Electronics Forum"** – for the latest market trends and technological developments
- **"PCIM Conference"** – for Power Electronics, Drives, Motion and Control

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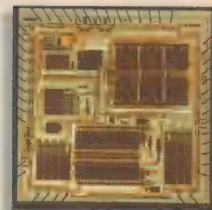
**Fair Opening Hours**

October 13	9: 30 am - 10: 00 pm (Opening Ceremony) 10: 00 am - 6: 30 pm
October 14-15	9: 30 am - 6: 30 pm
October 16	9: 30 am - 5: 00 pm

Trade only. Visitors under the age of 18 will not be admitted.



# Solid State *Update*



Keeping you informed on the latest developments in semiconductor technology

## Video processor IC for digital cameras

Burr-Brown's new VSP2000 video signal processor is a complete mixed-signal processing IC which provides CCD output signal conditioning and high resolution, 10-bit analog-to-digital conversion (ADC) for use



in capturing images in consumer video and digital still cameras.

The VSP2000 offers low voltage, low power operation and excellent low noise performance. Low voltage (2.7V) and low power (190mW at 3V) requirements make it ideal for portable equipment by extending battery life, while the low noise provides improved picture quality.

The device's primary channel features dual input signals, providing a signal and colour reference to better extract pixel information from the camera's CCD processor —

enhancing image clarity. VSP2000 offers 34dB gain ranging with analog control for varying background light conditions and black level clamping for an accurate black level reference. In addition, it provides linear and stable gain control along with short black level recovery time after gain changes. Other features include an 18MHz conversion rate and no missing codes.

For more information circle 275 on the reader service card or contact Kenelec, 2 Apollo Court, Blackburn 3130.

## Sound synthesis ICs

Atmel has announced a new generation of sound synthesis integrated circuits (ICs) in their Dream product family. These fully integrated chips, using a process called wavetable synthesis, are able to play music coded to the Musical Instrument Digital Interface (MIDI) standard as well as fully digitized voice and sound effects.

The new designs provide a complete choice of functionality versus price, but all maintain the high quality and sound fidelity that the Dream family is known for. The top of the range SAM 9707 Integrated Sound Studio IC offers exceptionally high quality synthesis, including support of the new downloadable sounds (DLS) standard. It is claimed ideal for implementing professional quality multitrack sound recording and playback direct to and from disk on a PC, and includes four-band equalization, reverb and chorus.

For extra compatibility with the large volume of professional MIDI compositions available and with the express permission of Roland Corporation, Atmel Dream is able to offer sound banks that comply with Roland's enhanced GS Format(R) standard. Free to developers, Dream is introducing a single development tool set for its complete synthesis IC range enabling OEMs to customize Sounds Banks and DSP code.

For more information circle 276 on the reader service card or contact GEC Electronics, Unit 1, 38 South Street, Rydalmere 2116.

## High speed buffers for A/D converters

Burr-Brown's new SpeedPLUS OPA680 (single) and OPA2680 (dual) are wideband, unity gain stable, voltage feedback operational amplifiers using a new internal architecture to provide high slew rates and full power bandwidth. A new output stage architecture provides high output current with minimal voltage headroom. OPA680 and OPA2680's combination of features makes them very suitable for single supply ADC (analog to digital converter) input driver or RGB line driver applications.

Using a single +5V supply, the OPA680 and OPA2680 can deliver a 1V to 4V output swing with over 100mA drive current and 150MHz bandwidth. Their low 6.4mA supply current is precisely trimmed at 25°C.

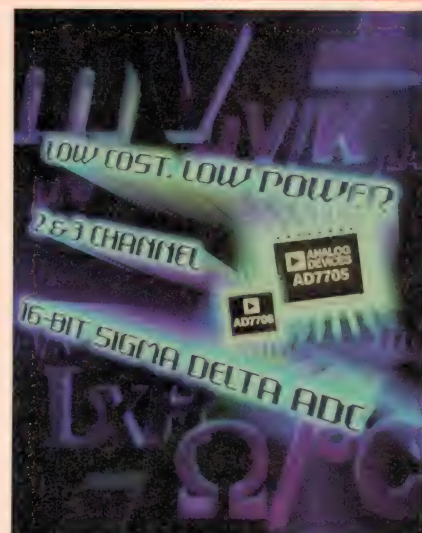
## Lowest power 16 bit sigma-delta ADCs

Analog Devices' new AD7705 and AD7706 16-bit sigma delta analog-to-digital converters offer a typical INL (integral non-linearity) of +0.0003%. The ADCs offer programmability, low power consumption (1mW max @ 3V) and multiple channels for DC and low frequency AC measurement applications such as process control, battery monitors, temperature and pressure transmitters, industrial and hand-held consumer instrumentation, and data acquisition. The two ADCs differ only in input structure.

The very low power consumption of the devices allows them to be loop, battery or locally powered. The on-chip PGA (programmable gain amplifier) can accommodate both low and high-level analog inputs with no external conditioning hardware. Programming is achieved through a standard three-wire serial interface, enabling designers to configure the output update rate, PGA gain (1-128), signal polarity, channel selection, choice of calibration models and a MCLK OUT disable feature to further reduce power consumption when using an external clock.

The converters operate from a single 2.7-3.3V or 4.75-5.25V supply. The AD7705 features two fully-differential analog input channels while the AD7706 has three pseudo-differential input channels. Both devices feature differential reference inputs allowing maximum design flexibility. Input signal ranges of 0 to +20mV through 0 to +2.5V can be accommodated on both devices when operating with a VDD of 5V and a 2.5V reference.

For more information circle 271 on the reader service card or contact Analog Devices, PO Box 2098, Rosebud Plaza 3939.





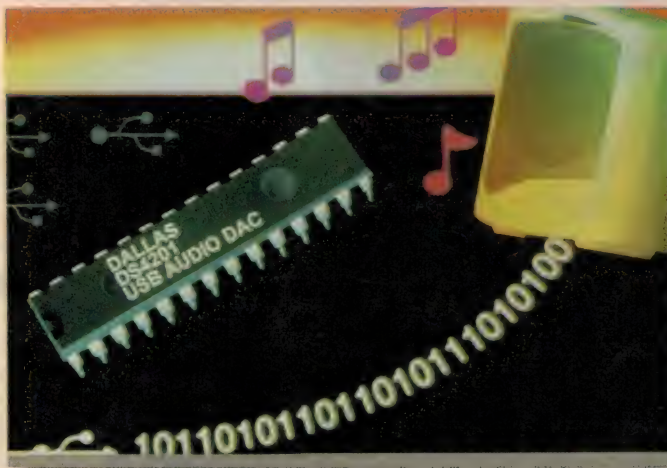
## USB-compliant stereo audio DAC

A stereo audio digital-to-analog converter (DAC) designed for next-generation multimedia PCs is available now from Dallas Semiconductor. Fully compliant with the Universal Serial Bus (USB) specification, the DS4201 USB Audio DAC is a complete, easy-to-use solution for USB digital audio playback.

One of the first USB audio devices available, the DS4201 complies fully with Version 1.0 of the USB specification and Version 1.0 of the USB Device Class Definition for Audio Devices. The chip, available in a 28-pin DIP and 44-pin QFP, integrates a USB function core, a full-speed USB transceiver, a stereo 16-bit sigma-delta digital-to-analog converter, and digital signal processing.

A USB host system can use the DS4201's power management features to control the power consumption of the chip, as well as that of external audio circuitry such as amplifiers or their power supplies.

For more information contact Dallas Semiconductor, 4401 South Beltwood Parkway, Dallas, Texas 75244-3292.



This trim, along with low temperature drift, guarantees lower maximum supply current over temperature than competing products.

Key specifications include unity gain stable (400MHz at  $G = 1$ ), high bandwidth (220MHz at  $G = 2$ ), 1800V/us slew rate,



+190mA/-150mA output current, dual (+/-5V) or single (+5V) supply operation, and 25ns/100ns enable/disable time.

For more information circle 273 on the reader service card or contact Kenelec, 2 Apollo Court, Blackburn 3130.

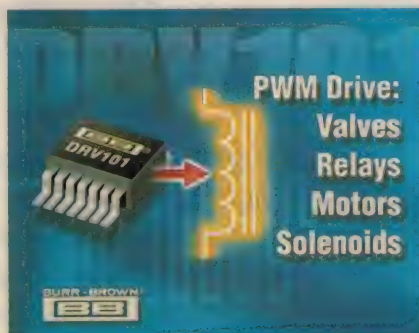
## PWM solenoid & valve driver

Burr-Brown's new DRV101 is a complete low-side power switch employing a pulse-width modulation (PWM) output that lowers power dissipation and reduces heat rise, resulting in higher reliability. Its rugged design is ideal for driving electromechanical and thermal devices such as valves, solenoids, actuators, positioners, relays, heaters and lamps. Applications include on/off and proportional control in general fluid and gas flow systems, medical equipment, industrial control, factory automation, and motor speed control.

DRV101 can be set to provide a strong initial solenoid/valve closure, automatically switching to a 'soft' hold mode for power savings. This function is particularly useful when driving mechanical loads that require a much higher current to 'pull-in' than they do

to 'hold'. The duty-cycle can be set by a resistor, an analog voltage or D/A converter for versatility.

The built-in PWM output function includes an internal 24kHz oscillator, pulse-width modulator, digital control input, external delay and duty cycle adjust, thermal shutdown, and over/under current detection. An output flag indicates fault conditions. Other features include high output drive (2.3A), wide supply range (+9V to +60V),



and full protection against overheating and over current.

For more information circle 274 on the reader service card or contact Kenelec, 2 Apollo Court, Blackburn 3130.

## Three-stage 1.9GHz GaAs power amp

A new three-stage gallium-arsenide (GaAs) integrated power amplifier chip introduced by Motorola is claimed to offer such outstanding RF power gain that it will enable designers to use fewer packages in PCB designs — leading to further miniaturization of cellular phones and other portable communications equipment. Designed with Motorola's planar GaAs MESFET process, it achieves output power of 32dBm, with a power gain of over 27dB, from a 3.6V supply.

Motorola claims that because it uses a depletion mode MESFET process in GaAs, the power amplifier exhibits the best tradeoff

of gain, efficiency, cost and manufacturability available today. The new device, designated type MRFIC1817, also features a reduced operating voltage level (3.6V) which will allow use of a smaller battery in most designs. The MRFIC1817 comes in a novel 16-lead power flat package (PFP) which features an exposed solderable metal back, giving it better thermal conductance and lower inductance to ground. This makes for better thermal and electrical performance by the device.

The new power amplifier is suitable for use in 1.0W DCS 1800 cellular phones and also provides beneficial performance in CDMA and TDMA base station driver amplifier applications. It is the fourth device in a Motorola family of GSM integrated power amplifiers for the 900MHz and 1.9GHz bands.

For more information circle 278 on the reader service card or contact Motorola Semiconductor Sales, 673 Boronia Road, Wantirna 3152. ♦

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# New Products

## DMM also measures frequency & distortion



The new Keithley Instruments Model 2015 Total Harmonic Distortion-Multimeter combines audio band quality measurement capabilities with a full function 6-1/2 digit DMM. The instrument allows distortion, voltage, resistance, current and frequency measurements to be made with one programmable, space-saving, half-rack instrument.

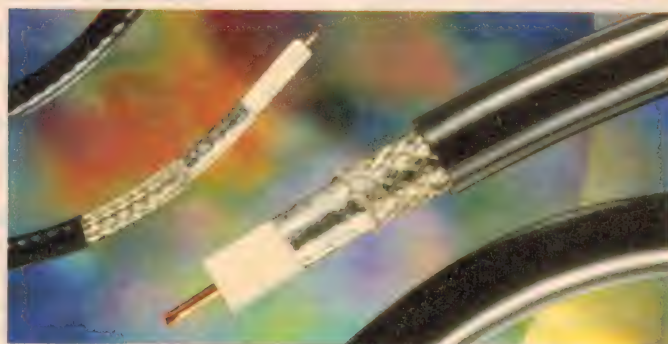
The Model 2015's distortion measurement capabilities include Total Harmonic Distortion (THD), THD+Noise, Signal-to-Noise plus Distortion (SINAD) and individual harmonic magnitude measurements. The DMM portion of the instrument provides 13 functions and is fast, accurate and highly stable.

Claimed as the only dual-function instrument of its type, the 2015 is designed for production applications in a broad range of industries. The instrument's small size, high speed, and measurement capabilities make it well suited for audio band applications.

The 2015 measures THD over a wide frequency band, from 20Hz to 50kHz. THD measurement speed, which depends on operating mode and input waveform, is at least 16 rdgs/s. The instrument measures over a wide range of inputs, from 0.1uV to 750V RMS, and has a low -94dB of residual distortion. It also contains an audio band (20Hz - 20kHz) two-phase sinewave source for generation of a fundamental stimulus signal.

For more information circle 241 on the reader service card or contact Scientific Devices Australia, 118 Atkinson Street, Oakleigh 3166.

## Precision video co-ax cables



Belden Australia has recently added two new 75 ohm precision video coaxial cables to its Brilliance broadcast lineup.

Belden Brilliance 1855A SDI Precision Video Coax has a 30% smaller diameter and a lighter weight than standard RG-59/U type cables. The company says this size/weight factor makes the new cable ideal for analog and serial digital signal transmissions in either mobile trucks — where both space and weight restrictions

## Arb generators accept DSO waveforms

The Tektronix AFG300 Series Function and Arbitrary Waveform Generators are two signal source instruments designed to transfer waveforms directly from a digital storage oscilloscope (DSO) such as the TDS210. This allows them to verify new designs by simulating mechanical to electrical converters or other signals that could otherwise be generated only with considerable set-up time and cost. The capability to directly transfer waveforms from all Tektronix DSOs is likely to be a big time saver for users.

There are two models, the single-channel AFG310 and the dual-channel AFG320. Both are designed for frequency requirements less than 16MHz and for benchtop or automated test use. Standard functions include Sine, Square, Triangle, Pulse and Arb. The arb output is 16MS/s internal clock rate, 8MHz maximum output frequency and 12 bit vertical resolution. Record lengths are 12K and non-volatile memory holds up to four 16K waveforms.

For applications requiring two phase-coherent signals, such as current and voltage in power measurements and automotive anti-



lock braking systems at the design stage, the AFG320 dual channel option provides more flexibility than does a single-channel instrument.

Included with the AFG300 series is WaveWriter, a Windows-based software package for easy creation and editing of waveforms. The software provides file I/O capability for other software such as LabView Matlab and Mathcad, allowing additional analysis. Data can be copied via the clipboard into these programs.

For more information circle 242 on the reader service card or contact Tektronix Australia, 80 Waterloo Road, North Ryde 2113.



can be severe — or production studios and post-production environments. This cable is capable of transmitting Society of Motion Picture and Television Engineers (SMPTE) 292M serial digital signals up to 61 metres with maximum clarity and reliability.

Where longer transmission distances are required, Belden Brilliance 7731A (RG-11/U type) Low Loss Serial Digital Video Coax delivers 1.45Gb/s HDTV signals to distances up to 152 metres, and is NEC CMR rated. It is claimed to be the ideal choice for studio and post-production sites — including between-room and between-facility installation — and it complies with the SMPTE 292M Standard for bit-serial interface for HDTV systems.

For more information, circle 245 on the reader service card or contact Belden Australia, Olympia Street, Tottenham 3012.

### Li-ion battery charger

Keene Electronics (UK) have released a new Universal Camcorder Battery Quick Charger/Conditioner. Compatible with most new Li-ion camcorder batteries including Sony NPF530/730, Canon BP911/924, Panasonic VWVBDIE and JVC 7.2V BNV812U, it is also compatible with NiCd and NiMH Panasonic 4.8V and Sharp 3.6V BTN/BTH series batteries.

Features include a built-in timer control, over-voltage protection and short circuit protection. It can therefore be used to safely charge NiCad, NiMH and SLA camcorder batteries as well as lithium-ion types. It can fully charge an empty battery in as little as 80 minutes, and can be powered from a car battery or from the mains (240V adaptor and leads supplied). A discharging function helps eliminate memory effect caused by recharging partially charged NiCad and Ni-MH batteries. It is therefore suitable for replacing lost or broken original chargers, or as a spare power station.

The Keene Universal Charger/Conditioner carries an RRP of \$129 plus \$12 P&P. For more information circle 247 on the reader service card or contact VideoCam Accessories, PO Box 2000, Strawberry Hills 2012.

### 300W supplies with PF correction

C&D Technologies Power Electronics Division has introduced the NX301 and NX350 series of compact, multiple-output power supplies, offering 300W and 350W ratings respectively. The supplies also offer active input power factor correction (PFC). The active PFC circuitry not only provides compliance with EN61000-3-2, but also accommodates a wide-input voltage range of 90-264V AC for global applications and will even operate from DC inputs of 120-370V.



The PFC input stage is followed by a two-transistor forward converter which provides a proven architecture for high-reliability requirements. EMI compliance to FCC/BCE Class B requirements, as well as safety agency approvals from UL, CSA, and TUV and the CE Mark provide engineers with the capable platform needed to power systems deployed worldwide.

A broad array of standard output configurations is available. All outputs are fully isolated and regulated. Active current sharing is standard to simplify N+1 redundant requirements in fault-tolerant applications. Auxiliary outputs are designed to sustain high surge current demands to support fan and disk drive spin-up requirements.

For more information circle 246 on the reader service card or contact Kenelec, 2 Apollo Court, Blackburn 3130. ♦

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See Review in E. A. June 98 p 85



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- 3 models — Average ; True RMS; CIE125C has  $\mu$ F instead of A.

#### CIE 128 Automotive DMM >

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- Vdc, Vac,  $\Omega$ , 10A
- Auto off



#### < CIE 8088 Automotive DMM

- 3999 count
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- Vdc, Vac,  $\Omega$ , 20A

#### CIE 8042N Temperature DMM >

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- Warning beeper



#### < CIE CA-60 Current Clamp Adapter

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#### < CIE 610LC Infra Red Thermometer

- 3½ digit,  $\pm 3\%/3^\circ\text{C}$  accuracy
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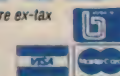
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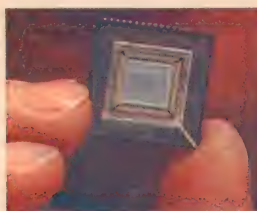
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# Silicon Valley Newsletter.....

## Sprint's ION: the all-in-one communications utility

US LONG-DISTANCE phone carrier Sprint has unveiled a revolutionary '21st century' communications technology that will enable consumers and business users to simultaneously log onto the Internet, send a fax, play a video game and conduct a telephone conversation (or video conference call), all over a single standard telephone circuit. It will also provide access to the Internet 100 times faster than current 56k modem technology.

Sprint said it has spent more than US\$2 billion to develop the so-called Integrated On-Demand Network, or ION, and to upgrade its fibre-optics communications network to handle the highly complex calls. The service will become available to US small and home businesses early next year and to consumers in late 1999.

Sprint chairman William Esrey said the ION network technology will effectively end the era of busy signals, broken connections and sluggish Internet downloads. "There is a rush-hour traffic jam on the information superhighway. We're going to change the way individuals and businesses communicate."

ION combines traditional circuit-switching with fibre optics and high-speed data transmission technology. Instead of separate accounts for local, long-distance and Internet services, customers would receive one bill.

Market research has shown that some 16 million American households currently

but customers will have a choice of several pricing plans.

One problem facing Sprint in bringing ION to market is that the company will need approval from various local phone companies to hook its new network to local phone systems. Because the ION service will allow Sprint to compete with those local phone companies for their business, the company faces tough negotiations with them.

## SIA sees decline in '98 chip market

IN A REVERSAL of earlier predictions of growth for the global semiconductor industry, the Semiconductor Industry Association (SIA) now sees chip sales declining 1.8% in 1998 to US\$134.6 billion, largely due to Asia's serious economic troubles.

In addition to, and partly because of lower chip consumption in the Asian markets, memory and other chip prices have continued to be under severe pressure. That has resulted in a continued glut of memory chips. "The financial turbulence in Asia and other market changes has crimped the expected expansion of global chip markets in early 1998", said SIA President George Scalise.

Even in the North/South American market, traditionally the strongest for semiconductors and the least affected by Asia's

woes, chip sales will fall this year by about \$3 billion to around US\$43 billion.

The impact of the continued recession in chip sales has begun to show in a new wave of layoffs. National Semiconductor announced in May that it plans to lay off 1400 people. Intel, the world's biggest chipmaker, expects flat revenue for the year and will eliminate 3000 jobs. And Applied Materials, the biggest equipment supplier to the industry, is offering voluntary severance packages to more than 2000 workers to cut costs.

Late last year, the SIA forecast about 8% growth for the global chip market. But in the first three months of this year, the industry had a sharp drop in sales because of weak Asian currencies. First-quarter revenue declined 10.2% in the Americas, 4.9% in Europe, 11.5% in Japan and 9.7% in Asia, according to the SIA.

## NEC plans 0.15um, 300mm fab in California

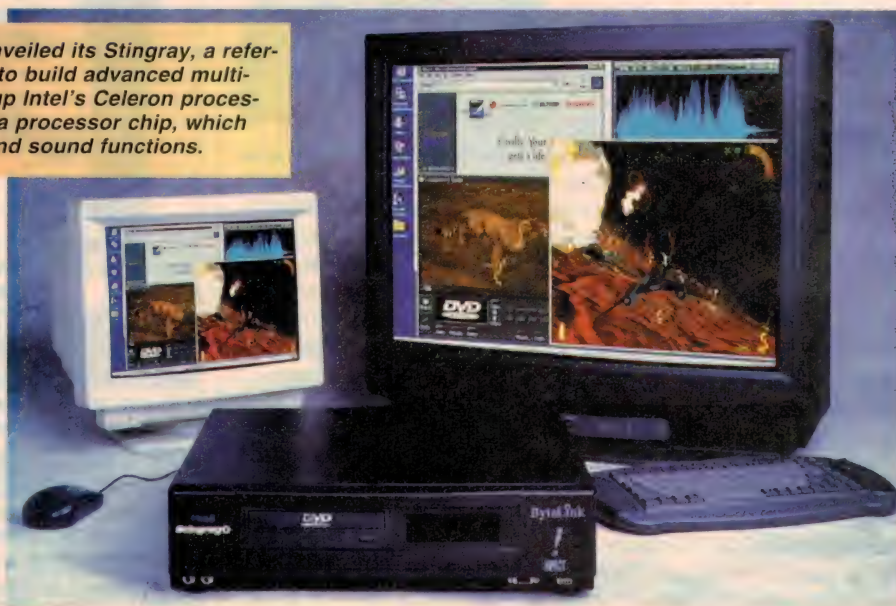
NEC ELECTRONICS INC, the California-based subsidiary of the giant Japanese electronics company, has announced plans to spend US\$1.4 billion to build an advanced 300mm wafer-based semiconductor plant in Roseville — near Sacramento.

The fab will produce both high-end multimedia logic circuits as well as high-end memory chips, including 256Mb and 1Gb DRAMs when it goes into operation in 2002.

**Sunnyvale firm Chromatic Research has unveiled its Stingray, a reference design for PC manufacturers looking to build advanced multimedia PCs for as low as US\$799. It teams up Intel's Celeron processor with the company's Mpact2 3DVA media processor chip, which integrates a raft of 3D graphics and surround sound functions.**

spend US\$110 a month or more on telephone and online services. Sprint considers this the prime target for its ION services, especially since the service will offer Internet access at 100 or more times the speed of traditional modems and telephone lines. At the same time, Esrey said Sprint's costs for delivering a typical voice phone call will drop by more than 70%. A video call will be cheaper than a typical long-distance call today.

The ION service would work much like an electric utility. Once set up, the service will be 'on' continuously. Users only pay for the time they are actually using ION services. Sprint has not set prices for the ION service,





Some 700 people will be working at the site, which will use design rules starting at 0.15 micron. NEC said when the plant is completed, it will be one of the largest and most modern semiconductor manufacturing plants in the US. The facility is expected to produce 20,000 wafers per month.

## Compaq-Digital merger approved

COMPAQ COMPUTER HAS gained approval from the Federal Trade Commission to proceed with the announced US\$9.6 billion take-over of Digital Equipment. Earlier in March, the merger of Houston-based Compaq with DEC, based in Maynard, Massachusetts, was cleared by the European Union's antitrust regulatory body.

FTC spokesman Victoria Streitfeld said the FTC had closed the investigation. In the letter by antitrust enforcement chief William Baer, the FTC said it "reserves the right to take such action in the future as the public interest may require to ensure that the combination does not hurt competition".

## Novellus launches its copper tools

CHIP EQUIPMENT MAKER Novellus, based in San Jose, has upstaged competitor Applied Materials with the launch of a new line of systems to manufacture high-speed semiconductors using a copper interconnect technology. Since IBM first announced the commercial viability of copper interconnects instead of aluminum, many chipmakers around the world have accelerated programs to integrate copper interconnects into their chip manufacturing operations. Copper increases the speed with which electrons move through a chip, due to its lower resistance than aluminium. But until now, copper has proven too difficult to use in the chip manufacturing process.

"As the geometries have gotten smaller, there is a need to change materials. The world is now moving to copper. Copper has the potential to double the speed of an advanced microprocessor, while reducing the number of metal layers by as much as 50%. As a result, chipmakers can create higher performing devices that consume 30% less power and are 20-30% cheaper to produce" said Richard Hill, chairman and CEO of Novellus.

The centrepiece of Novellus' new 'Damascus' copper line is SABRE, a US\$3 million copper deposition system that deposits copper onto a semiconductor wafer during a complex seven-step process.

While Novellus refused to identify companies which have already ordered evaluation copies of the SABRE, the company showed a videotape with executives from Intel, IBM, Motorola, and Advanced Micro Devices addressing the advantages of using copper technology in future semiconductor manu-

facturing. Hutcheson said he believes all are either working with a Novellus Damascus system or have one on order.

## Motorola losing 15,000

MOTOROLA IS SLASHING its payroll by a whopping 15,000 workers, or 10% of its workforce. The action comes in reaction to shrinking demand for some of the company's products and global pricing pressure, especially in semiconductors, and because of the economic crisis in Asia.

Motorola president Robert Growney said the move will save the company some US\$750 million in annual operating expenses. "It is clearly time to accelerate the implementation of our renewal plan", Growney said. Motorola expects to report a loss of nearly US\$2 billion for the second quarter. In the most recent first quarter, the company's net income fell to \$180 million from \$325 million.

The consolidation will affect most of Motorola's operations, but is expected to hit particularly hard in the semiconductor sector, along with messaging, information and media segments.

Motorola has been hurt by falling semiconductor prices, but also by increased competition for cellular phones and equipment from Lucent Technologies, Sweden's LM Ericsson, Finland's Nokia and Canada's Northern Telecom. Motorola's market share in wireless systems has declined from 25% to 15% since 1995.

## Motorola & Lucent merge DSP efforts

MOTOROLA AND LUCENT TECHNOLOGIES have formed a strategic alliance in which the two firms will jointly develop a new generation of digital signal processor (DSP) circuits for wireless and communications devices.

As part of the deal, Lucent and Motorola will set up a design centre in Atlanta, to be known as Star+Core, which will employ about 100 IC design engineers. Both firms will cross-license each other's existing DSP products and technologies.

Star+Core will open before the end of this year. The core design of the new DSP architecture is expected by mid-1999. It will be used by both companies to develop new DSPs. The first end-user products resulting from the alliance will reach the market in about two years, according to John Dickson, president of Lucent's Microelectronics Group. He added that he expects the cooperation with Motorola to accelerate development of advanced processors for the communications, transportation and consumer electronics industries.

DSPs are the fastest-growing sector in the semiconductor market. Sales volume is expected to balloon from around US\$4.1 billion in 1998 to \$14 billion in 2002. ♦

## Honda's rather expensive firmware bug

A BUG IN THE SOFTWARE that controls the emission systems in 1.7 million Honda automobiles sold in the United States since 1995 will cost the Japanese car maker some US\$17 million in environmental pollution and damage penalties and fines. Honda America faces additional costs of up to \$250 million in costs associated with fixing the bug.

The bug caused a failure in Honda's second-generation On-Board Diagnostic system (OBD II), which tracks engine and emission-control performance. The system is supposed to set off the 'check engine' dashboard light when something goes wrong that could lead to more pollution. However the bug caused the OBD II systems to fail to detect and report spark plug misfires, which cause greater than acceptable emissions of pollutants.

The defect has caused an extra 8000 tons of hydrocarbons to be released into the air annually. Honda officials said the system's program detected major misfires, but missed minor ones. The bug was discovered during a routine inspection by staff at California's Air Resources Board (CARB).

As part of an out-of-court settlement, Honda has agreed to pay US\$6 million in penalties to CARB, including \$3.5 million for environmental research projects. It will also pay US\$10.1 million in federal fines and an additional \$1 million for federal environmental projects.

The fines are only a small part of the estimated US\$250 million in additional cost to Honda, which must recall the 1.7 million vehicles and fix the problem. Honda must also extend the emission-control systems in the vehicles involved to 14 years or 150,000 miles and provide two free system inspections and one free vehicle tune-up.

## Intel slashes chip prices

INTEL HAS ANNOUNCED cuts in the price of some of its most popular processor chips, including many Pentium II versions, by up to 32%.

The price of its 400MHz Pentium II, only introduced in April, dropped by 12% to US\$722 from \$824. Intel also cut the 350MHz Pentium II by 16% to US\$519 from \$621, when the chips are ordered in quantities of 1000. The new 266MHz Celeron was cut by 32%, down to just US\$106.



# New Generation Printing Technology

**The computer printer market is now offering a huge array of models — colour and B&W, lasers and inkjets and bubblejets and dye-sublimation printers, plus models for each of the standard paper sizes. Many of the inkjet/bubblejet makers have also released a 'new generation' of models claiming super high resolution, photographic tonal realism or both. Here's an attempt to clarify some of the developments behind these in particular.**

by Jim Rowe

If you've wandered through a computer store recently, or even looked through a computer magazine, you'll be well aware of the enormous number and variety of printers now available. Even if you restrict your focus to colour inkjet/bubblejet models, there's still a bewildering range of models providing different speeds, print resolutions and levels of photographic realism — not to mention those to suit different paper sizes (everything up to A2 and A1), and special models for use with networks and laptop/notebook PCs.

It can all get rather confusing, especially if you're trying to decide on a new printer. Even comparing the models from a particular manufacturer can be difficult, thanks to the high levels of marketing hype and relatively low levels of objective technical information available. If you believe the impressive sample printouts on offer from the marketing people, for example, virtually *all* models from every manufacturer are now capable of near-perfect photographic quality!

In this kind of a situation, genuine technical breakthroughs can tend to get 'lost' in the overall marketing confusion. Which is unfortunate, because there have been some very significant developments in printer technology in the last year or so.

The 'big name' makers of colour inkjet/bubblejet printers in particular have made big strides in developing technology to produce higher resolution and more 'realistic' output. They've also been able to make the printers both faster and cheaper, at the same time. It's these developments that are reflected in many of their latest models, and will also be behind the even newer models they'll be releasing later this year.

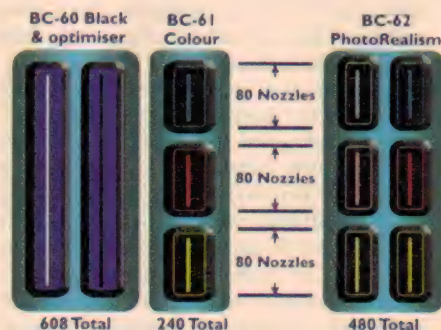
In this article I'll attempt to explain briefly some of the more salient developments in technology, by reference to examples and material gleaned from some of the

main manufacturers. We'll look at these in turn, in alphabetical order to forestall accusations of bias.

By the way, bear in mind that many of the developments that have taken place in inkjet/bubblejet printers have essentially been made possible by progress in two key areas. One is the ability to accurately micro-machine tiny holes, for the printing nozzles; the other is the ability to precisely and rapidly modulate the flow of fluids, to deliver ever-smaller (but accurately controlled) drops of ink, at faster and faster rates...

## Canon

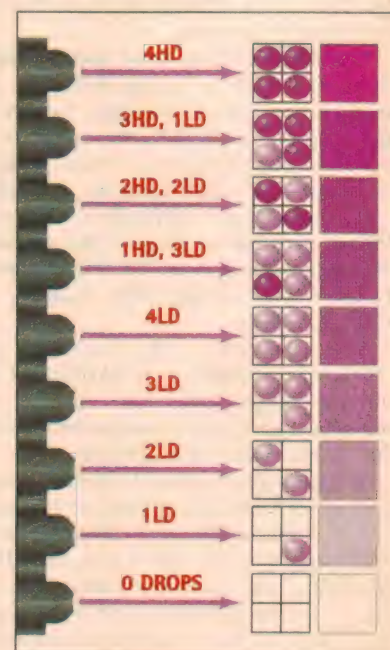
Canon has a long tradition of designing and manufacturing quality imaging products, including cameras and photocopiers, and is the inventor of Bubble Jet technology. Although it also markets laser printers, its range of colour Bubble Jets is probably where it's had the most success of late, and the latest models do incorporate some very interesting new technology.



*The print head in Canon's BJC-7000 uses 304 nozzles each for the black ink and 'optimiser' fluid, and 80 nozzles for each colour ink. When the BC-62 cartridge is used, providing three additional inks, this gives a total of 1088 nozzles and seven inks. Two different droplet sizes give nine saturation levels per pixel.*

There seem to be two main developments, which Canon calls second generation PhotoRealism and P-POP (for 'Plain Paper Optimised Printing'). The former allows much greater resolution and photographic realism, while the latter allows these advantages to be realised not just with special and expensive glossy coated paper, but with low cost plain paper as well.

The essence of Canon's PhotoRealism seems to be the use of proprietary low-density inks, combined with a special print head delivering either multiple small drops to each dot location on the paper, or drops of varying size and ink density. Using the company's 'Drop Modulation Technology' (DMT) the print head has nozzles capable of producing either small or large drops of ink, and driver software can direct it to deliver multiple drops to each dot location on the







*Five of the new colour inkjet/bubblejet models which incorporate 'new generation' technology (clockwise from top left): HP's DeskJet 720C and 1120C; Canon's BJC-4300 and BJC-7000; and Epson's Stylus 850.*



paper. The nett result is an ability to print at a much higher resolution, and/or the ability to reproduce much finer gradations in colour and grey scale tone.

For example in the low priced BJC-4300, which can print at up to 720 x 720dpi and at up to two pages a minute in photo realistic mode, the BC-22e Photo print head has a total of 136 nozzles: 64 for black, and 24 each for the three colours (cyan, magenta and yellow). Here the DMT provides five different saturation levels for each ink on each dot location, giving much better resolution and colour gradation than could be achieved without the special inks and DMT technique.

In the new BJC-7000 mid-priced printer, PhotoRealism is taken a stage further. Here the print head has more nozzles and they're smaller — giving smaller potential drop sizes and higher resolution (up to 1200 x 600dpi). Three additional low-density colour inks are used, giving a total of seven inks in all, and this is combined with the DMT to

produce nine different saturation levels per colour, per dot location. Needless to say the potential colour gradation is much smoother again — 22 times more than the first generation of PhotoRealism, according to Canon.

The BJC-7000 also features Canon's other new technology, P-POP. This involves applying a drop of special 'Ink Optimiser' fluid to the paper, just before the ink itself. The idea seems to be that the ink mixes with the Optimiser, and the two bond to the paper with less diffusion — giving crisper printing and more vivid colours, even with low cost plain paper.

The Ink Optimiser fluid is applied from a dedicated row of nozzles on the print head. For example the BJC-7000 has 304 nozzles each for the Optimiser and black ink, plus 80 nozzles each for the six colour inks (C, M, Y, and CL, ML, YL) — 1088 in all. They're capable of providing up to 100,000 drops per second.

Canon also claims that the combination of

inks and Ink Optimiser used in the BJC-7000 also gives a printout that fades less, lasts longer and is 99.4% water fast. This is defined as the colours retaining 95% of their optical sensity after being soaked in water for five minutes.

The BJC-4300 has an RRP of \$369, while the BJC-7000 sells for \$729. Canon also has a compact portable model, the BJC-80, for use with laptops and handhelds. It offers printing to 720 x 360dpi, five-level DMT for quite respectable PhotoRealism, and a built-in IrDA port for wireless connection to the PC. The BJC-80 has an RRP of \$499.

## Epson

Epson has been one of the market leaders in inkjet printing for some years now, and its latest range of Stylus inkjets offer what the company calls its PerfectPicture Imaging System (PPIS), coupled with Photo Reproduction Quality (PRQ) in the 'Photo' models.



PPIS seems to incorporate four technology components: Micro Piezo ink modulation technology, AcuPhoto Halftoning, improved QuickDry inks and Photo Quality Paper. The last of these is by no means unique, of course, because just about all of the makers rely on special coated 'photo paper' to achieve their best photographic quality.

Micro Piezo technology is a special ink drop modulator in the print head, using a piezo-electric transducer which allows Epson to achieve smaller and more accurately defined ink droplets. The drops in the latest models are about one-third the size of previous models, allowing Epson to claim 'Super MicroDot' performance and a resolution of up to 1440 x 720dpi. Micro Piezo is also claimed to deliver the droplets at about twice the rate of earlier models, for faster printing.

AcuPhoto Halftoning seems to be essentially a set of proprietary algorithms in the software drivers, which achieve improved colour gradation and tonal variations. And the QuickDry inks are said to combined high colour concentration with 'a super penetrating formula', which ensure that the ink droplets penetrate further and more rapidly

into the paper, to reduce diffusion and achieve sharper and brighter images.

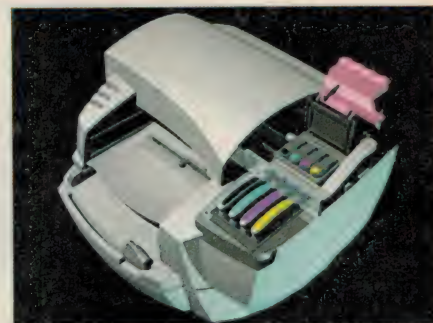
For the Photo models, Epson combines this PPIS technology with PRQ, a six-ink system involving two additional colours: light cyan and light magenta. As before this gives improved colour gradation and smooth tonal rendering.

A good example of Epson's latest technology is the Stylus Photo 700, which combines all of the above technologies in a compact six-ink unit capable of printing on A4 paper or smaller at up to 720 x 720dpi on plain paper or 1440 x 720dpi on Photo paper. It has a 192-nozzle print head (32 for each of the six inks), and Epson is rather coy about the print speed — presumably it's not super fast. It sells for around \$795.

### Hewlett-Packard

Although it started off way back in test and measuring instruments, Hewlett-Packard has been at the forefront in the desktop printing market for many years. It produced the first laser printer, and in recent years has essentially set the pace with its inkjet printers as well.

The latest generation of HP inkjets takes



*Due to be released in Australia soon, HP's new DeskJet 2000C has four separate ink cartridges fixed at one end, feeding four heads (each with 304 tiny nozzles) via an umbilical cord.*

advantage of what the company calls its PhotoRet II technology, which combines micro ink droplets with multi-drop, multilayer printed dots, to achieve improved resolution and colour gradation. The print head uses a thermal drop generating system and very small nozzles, producing microscopic ink droplets of around 10pL (picolitres) in size at a rate of up to 12,000 per second.

The PhotoRet II system is theoretically capable of firing up to 16 of these micro droplets per colour and per dot location, to achieve an extremely high level of effective

# MARKET PLACE

Continued from page 83



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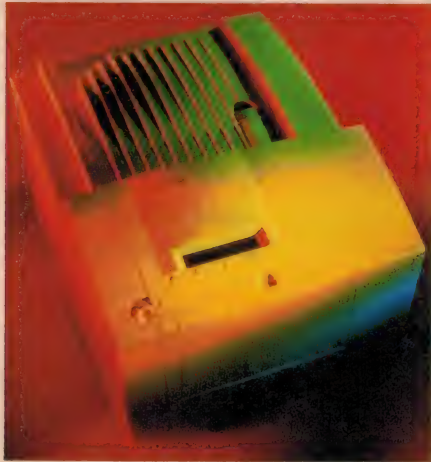
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*The Tektronix Phaser 360, a solid-ink colour printer offering up to 800 x 450dpi colour printing at speeds varying from 2ppm to 6ppm depending on the desired quality of reproduction.*

resolution and/or colour and tonal gradation. However it seems that most of HP's current PhotoREt II printers only use a subset of the possible combinations, to achieve essentially four levels of intensity per ink. However this still achieves 240 distinct colour shades per pixel, 30 times that of earlier inkjets — and without going to additional inks. Additional colours are achieved by layering the different inks, to give a very large palette.

The print head used in the two mid-priced PhotoREt II printers, the HP DeskJet 720C and DeskJet Professional 890C, has 300 black nozzles and 64 nozzles per colour — a total of 492. It achieves 300 x 300dpi printing at 2ppm in the 'EconoFast' mode, and effectively 600 x 600dpi at either 0.5ppm or 0.25ppm in the 'Normal' and 'Best' modes respectively. (HP makes a point of eschewing sheer 'dpi resolution rating' in favour of colour print quality, and in contrast with some of the other makers isn't afraid to specify the printing speed of its models.)

Coupled with PhotoREt II in the new printers is HP's ColourSmart II, a set of intelligent print drivers which employ special colour lookup maps and halftoning algorithms to optimise colour reproduction.

Along with the DeskJet 720C and DeskJet 890C, the other current HP inkjet to offer PhotoREt II is the DeskJet 1120C. This can print on paper of up to A3 size, at speeds comparable to the other two. The DeskJet 720C, 890C and 1120C typically sell for around \$599, \$785 and \$895 respectively.

Hewlett-Packard has also just released an impressive new inkjet in the USA, which should reach us here around September-October. Called the HP 2000C Professional, it is claimed as a real 'breakthrough' in inkjet printing technology — achieving higher resolution and print quality, lower printing costs and also a printing speed increase of typically about 3.6 times that of even existing PhotoREt II printers like the HP 890C.

The 2000C apparently still employs PhotoREt II technology, but pushes the

envelope even further by employing separate print heads for each colour, each with no less than 304 nozzles — a total of 1216 nozzles. These deliver the smallest droplet size yet, quoted as only 8pL for the colour nozzles and 35pL for the black nozzles. Each print head includes a 'Smart Chip' containing calibration data obtained automatically during manufacture.

Along with the new print heads, the 2000C also uses individual and separately replaceable cartridges for each of the four inks. This is claimed to reduce running costs, by allowing replacement of each cartridge only when it's exhausted. The cartridges are not integrated with the print heads, but mount in fixed sockets on the right-hand end of the printer. An on-demand ink supply system feeds inks to the print heads as needed via a four-tube umbilical cord. The print heads themselves have reservoirs holding 8mL of ink.

In demonstrations given in the USA, the HP 2000C was described as having 'blown out of the water' other inkjets from both HP and its competitors, especially in terms of colour printing speed. It sounds like HP's competitors will have to work hard to maintain their market shares, once the 2000C makes its full impact — especially as HP is pitching it at a very attractive price level. In the USA, it's selling for a street price of US\$799.

Of course Hewlett-Packard also sells an impressive range of laser printers, and in recent years has taken impressive steps laser technology — both lowering price and increasing both resolution and print speed. Its compact new low-end LaserJet 6L offers

600dpi printing at up to 6ppm, yet sells for only around \$675.

HP has also just released two new 'industrial strength' LaserJets for network and work group applications. There's the LaserJet 5000, which offers 1200dpi printing at 16ppm on paper sizes up to A3, and also the LaserJet 8000 which offers 1200dpi printing at 24ppm. The 5000 and 8000 have street prices of around \$3350 and \$5200 respectively.

## Tektronix

Like HP, Tektronix had its origins in the T&M business but expanded into printing technology some time ago. In this case it seems to have concentrated on high-end colour printers using solid ink, and more recently colour laser technology. The main advantages here are significantly faster printing and lower running costs, for network and work group applications.

Early this year Tek released its Phaser 360 solid-ink colour printer, which offers 800 x 450dpi printing at speeds varying from 2ppm to 6ppm depending on desired quality. Tek doesn't reveal much about the technology it uses, although it apparently uses a 100MHz RISC controller and uses a technology called TekColour CET to smooth colour and reduce grain. (Presumably the 'CET' stands for colour enhancement technology.) The Phaser 360 currently sells for \$7990 including tax.

For those who want the lower running costs of colour laser printing, Tektronix also offers the Phaser 560 — claimed as the fastest colour laser available. It offers full colour printing at up to 4.7ppm (monochrome 14ppm), with a resolution of up to 1200 x 1200dpi. The Phaser 560 also sells for around \$8000. ♦

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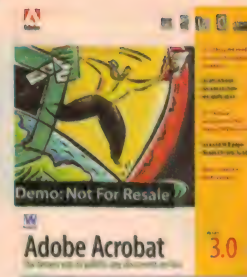
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# Adobe Acrobat 3.0

by Jim Rowe



From our recent survey, it appears that nearly half of *EA*'s readers already have an ISP account and are using the Internet/web, while another 20% or so are very close to doing so. One way or another, then, you're probably well aware of how much reference data and other information is now available on the net, and how convenient it can be to retrieve.

Sometimes it can be easier and faster to retrieve the data on a semiconductor device from the manufacturer's web site, for example, than finding the right databook and looking it up. There's also the added bonus that the downloaded data is the very latest version, with any errors more likely to have been corrected...

If you *have* retrieved any of this useful data, you'll know that it's generally in the form of a 'PDF' file, which needs an application called Acrobat Reader to open and display/print it. Acrobat Reader is an Adobe product, and is available for free downloading from many sources.

As it happens, Adobe developed the PDF or 'Portable Document Format', a few years ago. This was a bit before most of us knew we were going to need it, and as a result it's taken a while for everyone to catch up. But now it's become firmly established as a preferred format for transferring documents across the internet, and also on CD-ROM discs. PDF files are compact (resulting in

**You've downloaded those PDF files from web sites, and used Adobe's Acrobat Reader to display and print them out — great, isn't it? But chances are you're not nearly so familiar with Adobe Acrobat, the main package that's used to create those handy PDF files. We weren't either, until we tried it out for this review of Version 3.0...**

relatively short download times), they can be opened on both Windows and Macintosh systems (and other operating systems as well), and they can give printouts of surprisingly good quality.

But what exactly *are* PDF files, and how are existing documents turned into them? Well, PDF files are essentially compressed versions of PostScript-language documents. And they're compressed very efficiently. As far as I've been able to discover, the text, fonts and vector graphics are crunched up using an LZW-type lossless compression algorithm, while the tone graphics (images, etc) are squeezed using a 'lossy' (but adjustable) JPG-type algorithm. What this means is that when the PDF file is 'opened' at the other end, the text and vector graphics are reconstituted exactly as they were, while the images suffer only a small amount of degradation — exactly how much depending upon the degree of JPG compression used.

When it comes to the creation of PDF

files, it turns out that there are a number of options. For example some of Adobe's other applications (like Photoshop) are able to produce PDF versions of image files, directly.

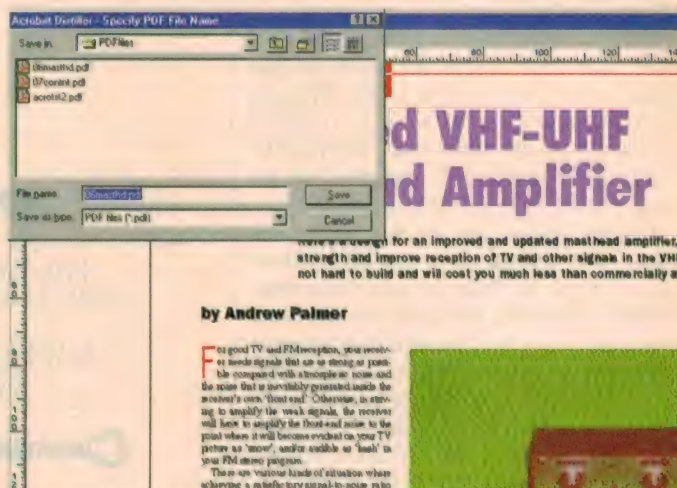
However for most of us, the main way to generate PDF versions of documents is using Adobe's Acrobat — or more precisely, one of its components, because it's actually a set of programs rather than one. This tends to provide an almost bewildering range of options.

For example in Acrobat 3.0, the latest version, there's Acrobat PDF Writer, a 'printer driver' which effectively creates PDF files of relatively simple documents simply by 'printing' to it; then there's Acrobat Distiller, which can convert even quite complex PostScript files into PDF form just by 'dragging and dropping' them into it; or you can use Distiller Assistant, which effectively turns Distiller into a 'printer driver' too, for simplified one-step ('print to PDF') conversion of complex documents.

Among the other components of the



Acrobat Distiller's Job Options dialog makes it easy for you to customise your compression options for images.



Distiller Assistant automates file conversion by turning it into a 'print to PDF' function, directly from your application.



Acrobat 3.0 package is Acrobat Exchange, a kind of 'industrial strength' version of Acrobat Reader, which lets you not only view PDF files but also modify them, capture and add additional images (from a scanner), and add things like links and bookmarks, movies and sound. There's also Acrobat Catalog, which creates full-text indexes of collections of PDF documents. And if that's not enough, you also get the full latest version of Acrobat Reader thrown in, plus online user and electronic publishing guides and an audio-visual tutorial...

Acrobat 3.0 comes on a CD-ROM and is compatible with Windows 3.1X, Windows 95, Windows NT 3.51 or later, and also a Macintosh with a 68020 or PowerPC processor. The recommended system for Windows is a Pentium or better, Win 95 or NT, 16MB of RAM (24MB for NT) and 50MB of hard disk space.

### Trying it out

I installed the review sample of Acrobat 3.0 on my 266MHz Pentium II system, running Windows NT 4.0 and with 64MB of RAM. It seemed to install without any hassles, although at first Distiller seemed to have difficulty in finding my TrueType fonts. This problem seemed to have evaporated next time I tried using it, though, and Distiller Assistant also began appearing on the task

bar automatically. From then all went well.

When you set up Distiller and Distiller Assistant, you have the ability to select various options in terms of Reader 2.0/3.0 compatibility, the resampling method used for reducing images files to 72dpi resolution (downsampling or subsampling), the degree of JPEG compression used, whether or not font compression is used, and how few characters of a given font need to be required before Distiller sends a font subset rather than the full font. In short, you can experiment and do quite a bit of customisation.

So far I've tried converting a number of documents into PDF form, and generally everything has gone quite smoothly. The resulting PDF files have been quite impressive, too.

You'll find a sample of my handiwork on EA's BBS and website, in the 'Internet Related Files' area, as **06masthd.pdf**. If you download it and open it with Acrobat Reader 3.01 or later (which is also available for downloading, if you don't already have it), you'll find it's a copy of the article from the June issue describing the updated VHF/UHF Masthead Preamp project. The colour pictures are made from our low-res positional images and are rather pixilated, but it'll give you a fairly good idea of the kind of 'electronic publishing' that Acrobat Distiller makes possible. Notice how crisp the text and

## Adobe Acrobat 3.0

Conversion/manipulation package for Portable Document Format (PDF) files. Compatible with Windows 3.1X, 95, NT 3.51 or later, and Macintosh.

**Good points:** Powerful, fairly easy to use.

**Bad points:** Slightly bewildering initially in terms of the different available ways of achieving your desired result. Perhaps a bigger printed manual and less reliance on on-line help would make things easier.

**RRP:** \$295

**Available:** Most major software suppliers, or enquire from Adobe Systems, PO Box 672, Lane Cove 2066.

PostScript diagrams are, for example. This file was produced simply by 'printing to a PDF' using Distiller Assistant, from the original Quark XPress document for the article.

Summarising, then, Acrobat 3.0 is a very powerful package for creating and manipulating PDF files. It's also surprisingly easy to drive, thanks to the features built into components like Distiller Assistant. So if you need to be able to send your documents efficiently over the net, there's no need to be wary; using Acrobat 3.0, converting them into compact PDF form is a lot simpler than you expect. ♦

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# Computer

## News & New Products

### Windows NT voice logging recorder

Australian manufacturer Electrodata has released Maxitrac, its new generation digital voice logging recorder. The recorder complements the company's existing range and provides such advanced features as LAN and modem connectivity for remote operation and service, higher channel capacity, and a Windows NT operating system.

Maxitrac is designed to improve efficiency in any business where the verification of conversations is important. For instance, where there is a disputed conversation, instead of both parties having to meet to listen to the conversation, the Maxitrac allows the conversation to be downloaded and replayed from a computer on the network. Even better, a copy can be sent by electronic mail to the party disputing the contents of the conversation — thus enabling quick resolution of disputes, and the saving of time and resources.

Modem access is also available on the Maxitrac to allow fast service and maintenance to be carried out anywhere in the world, either from Electrodata's factory, or



from the local distributor. Similarly, the Maxitrac can be accessed by a remote user via a modem.

The Maxitrac provides several working days of rapidly retrievable conversations. For customers already using a Windows NT network, it is also an easy fit. It can be accessed and/or controlled via various network management programs, and comes with an integrated remote-control facility. Other features include password security of recorder functions, monitoring of 'live' incoming calls and a lockable front cover to prevent unauthorised tape removal.

### PC-based video publishing

Miro Computer Products have released the miroVIDEO DRX, an entry level PCI-based digital video editing solution for Windows 95. The miroVIDEO DRX gives home video users sophisticated digital non-linear video editing capabilities, for an RRP of \$555 and available through all Harvey Norman Computer stores exclusively.

The miro VIDEO DRX is a complete digital video editing system that lets users capture analog video from a VCR, laserdisc or camcorder, saving it to the computer's hard drive. The digitised video can then be edited with the included easy to use MGI VideoWave desktop video publishing software. The software lets users create interesting transitions, wild special effects, as well as professional-looking titles, graphics and animations. Once editing is complete, users can output the final video sequence and record it back on to videotape, or view it on their television.

With PCI bus mastering technology, miroVIDEO DRX delivers impressive data rates of 3MB/second and Motion-JPEG



compression up to 6:1. It supports video resolutions up to 384 x 576 (PAL) at 50 fields/second, and supports S-VHS, Hi8, VHS and Video8 tape formats. In addition, it offers real-time video overlay for display of full-motion video directly on the PC monitor using a Direct Draw-compatible graphics board, so an additional video monitor is not required.

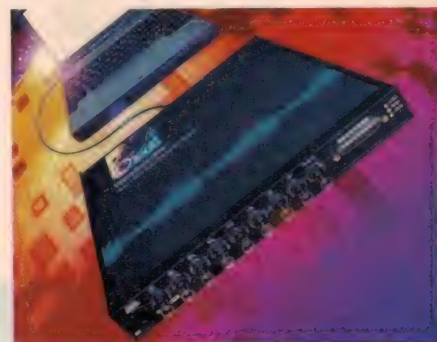
It requires a PC with a Pentium-compatible processor, one available 32-bit PCI slot with bus mastering, 16MB RAM, 500MB hard disk space and a 16-bit graphics card.

For more information circle 166 on the reader service card or contact distributor Lako Vision, 2/3 Wellington Street, Kew Vic 3101.

For more information circle 160 on the reader service card or contact Electrodata, 15 McDonald Street, Mortlake 2137.

### Portable PC-based 1MHz, 16-bit DAQ

Iotech's WaveBook/516 portable data acquisition system uses a DSP-based A/D design to achieve up to 1MHz sample speed while maintaining 16-bit resolution. Claimed as the first PC-based, multichannel system to combine high resolution and high speed in a portable notebook size form factor, the



WaveBook/516 should make it easier for engineers to acquire multiple channels of data in applications where speed and resolution are important. The 8-channel system can be expanded to sample up to 72 channels of voltage, acoustic, vibration, strain, temperature and other transducer inputs.

Operable from either AC or DC power, the unit connects to a notebook PC via the enhanced parallel port (EPP) or an optional PC-Card interface. Connection to a desktop PC is via the EPP port or an optional ISA plug-in card interface.

For more information circle 161 on the reader service card or contact Scientific Devices Australia, 118 Atkinson Street, Oakleigh 3166.

### Four & eight port serial comms cards

Keithley Instruments has released MetraByte Digi-Port Series of four- and eight-port serial communication boards for use with ISA-bus equipped PCs. The boards provide asynchronous, intelligent high speed multi-channel serial communication and contain a microprocessor for onboard serial I/O processing. The four port Digi-4Port and eight port Digi-8Port therefore provide an



easy way to connect multiple peripheral devices to a PC via the serial bus. The Digi-Port Series supports Windows 95 and Windows NT operating system platforms.

Each Digi-Port board features a 16-bit, Intel 12.5MHz 80186 onboard microprocessor that relieves the host PC's CPU of serial I/O processing tasks. The boards have four 8-bit registers to facilitate communications with the onboard microprocessor. The onboard firmware includes a high-level shared memory interface for optimal performance as well as extensive diagnostic capabilities. Because I/O tasks are handled on board, response time, throughput and overall performance are enhanced.

The boards support full modem control and full hardware handshaking (CTS, RTS, DSR, DTR and DCD) on all channels. They allow serial communication at distances up to 4000 feet and at data rates up to 115.2kb/s.

For more information circle 162 on the reader service card or contact Scientific Devices, 118 Atkinson Street, Oakleigh 3166.

### PC memory cards

M-Systems Flash Disk Pioneers has introduced a new series of PC Cards. The FlashLite PC Card Series offers easy to use data storage in a standard PCMCIA Type I interface. There are three new cards in the series: FlashLite Series II (Intel Series 2



compatible), FlashLite 100 (Intel Value 100 compatible) and FlashLite D Series (AMD D Series compatible), all based on linear technology. Offered in capacities of 1 to 32MB, the cards provide excellent read speeds, eXecute-In-Place (XIP) functionality and read/write capability.

The FlashLite Series is compatible with numerous existing systems, thus providing an immediate, easy to use solution for mass storage. They can be used with systems requiring XIP as linear memory cards, and can also be used as bootable Flash Disks, providing 100% hard disk compatibility when required. This functionality is enabled by TrueFFS technology, which provides efficient flash management with a small footprint, high reliability and high performance.

For more information circle 163 on the reader service card or contact Priority Electronics, 189 Bay Road, Sandringham 3191.

### Desktop colour laser printer

With its new HL-2400C colour laser line, Brother is targeting the pent-up demand of today's business user who wants to experience the colour output quality that they need



at a price they can afford, in the production of common daily business output.

Featuring a fast, up to four page per minute colour output speed, the HL-2400C is powered by a 100MHz RISC processor and is claimed as the fastest in its class. It can also function as a monochrome production printer due to its ability to print black and white pages at up to 16 pages per minute. Capable of producing images at 2400dpi class resolution, it combines crisp, sharp colour printing with affordable monochrome production printing.

The printer comes equipped with both PostScript Level 2 (BR-Script II) and PCL5C/PCL6 emulation standard. Both printers support Windows 3.1, 95, NT and Macintosh with EtherTalk in networked environments.

The Brother HL-2400C printer will be sold through Brother authorised value-added resellers, dealers and will include a one-year on-site parts and labour warranty. The RRP is \$5395 ex tax while the optional network print server NC-2010h is \$595 ex tax.

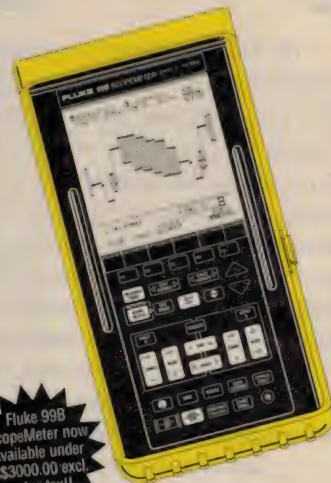
For more information circle 164 on the reader service card or contact Brother International (Aust), 7 Khartoum Road, North Ryde 2113.

### PCI multimedia cards

Philips Business Unit, Mastering & Duplication (M&D) has announced that its continued development of MPEG technology has culminated in a new range of PC cards. The cards are based on Philips' tremendously powerful multimedia IC, the 'TriMedia' processor.

The range comprises three PCI add-on cards: the TriCodec, TriDVD and TriDVD Plus. A PC with TriCodec fitted provides the capability to capture, encode, edit and compose video titles. It also supports DVD playback, and its extensive capabilities include Video-CD authoring.

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## TAP INTO OUR RESOURCES

The Industrial Affiliates program at Griffith University, invites industries to offer work to final year Microelectronic Engineering students for a period of three months. The students work with industries, producing research and design solutions from concept to prototype. In the past six years, 200 Griffith students have worked on industry projects from the conceptual stage through to completion of prototypes. Industry projects are now being accepted for the next program.

To tap into these resources, contact Carol-joy Patrick on telephone: (07) 3875 5007, fax: (07) 3875 6726 or email: [cj.patrick@sct.gu.edu.au](mailto:cj.patrick@sct.gu.edu.au)



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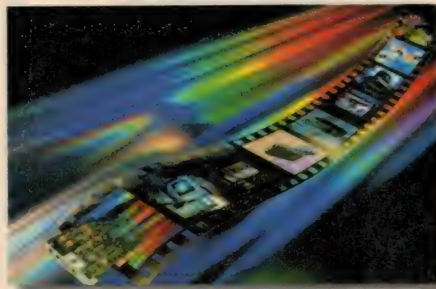
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## Computer

### News & New Products

TriCodec comes with supporting software for audio and video editing, and bundled programs include Adobe Premiere and Adobe Photoshop. Inputs are provided for analog video sources such as composite or



S-Video from a camcorder or VCR (PAL and NTSC). For efficient storage, captured video clips can be compressed to MPEG-1 with user selectable bit rates (1.2 - 4.6Mb/s). Audio for dialog tracks, sound effects and music can also be captured from VCR/camcorder, CD or cassette. The edited composition can be stored on VCR or authored to Video-CD format via a CD-R or CR-RW drive.

The other products in the range, in conjunction with a DVD-ROM drive, facilitate DVD-Video and Video-CD playback on a PC. TriDVD allows video display on the PC monitor using a standard VGA video card, and stereo audio is played via the PC's sound card.

For more information circle 165 on the reader service card or contact Philips Public Telecommunication Systems, 745 Springvale Road, Mulgrave 3170.

### Smartmedia card adaptor

Olympus have introduced an adapter that allows PCs operating Windows to read SmartMedia flash memory cards through a 3.5" floppy disk drive. The FlashPath adapter speeds and simplifies transfer of images from any digital camera that uses 2MB, 4MB or 8MB SmartMedia cards as memory storage, eliminating the need for cumbersome serial cables. It also provides a more workable alternative to the severe problem of limited storage capacity faced by some other manufacturers' digital cameras that use floppy disks...

With FlashPath, a user removes the SmartMedia memory card from the camera, inserts it into the FlashPath adapter, and plugs the adapter into any available 3.5" floppy disk drive. (FlashPath has the same size and shape as a 3.5" floppy disk.) FlashPath receives a 'drive letter' from the operating system just as a floppy disk would, and transfers data by copying the file as with a diskette. The adapter allows data transfer of up to 25KB/s, faster than a direct connection through a serial port cable. It also allows data transfers when the camera is not available. SmartMedia cards are used in all current Olympus digital cameras, and also models sold by Agfa, Epson, Fuji, Apple, Minolta, and Toshiba.

FlashPath is supplied with driver software for Windows 3.1x and Windows 95, and has an expected retail price of \$199.00.

For more information circle 167 on the reader service card or contact R. Gunz Photographic, Locked Bag 690, Beaconsfield 2014. ♦

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by Graham Cattley

**C**ONTRIBUTOR BOB PARKER recommends the Spread Spectrum Scene web site at <http://www.sss-mag.com/swindex.html>, and it has quite a lot on offer. It takes a couple of years to load in, but once you are there, you can download a goodly number of RF and antenna design programs. They have a couple of other areas on the site worthy of note, including a glossary, a history of radio, FAQs, tips and even a 'How to' page that covers a few RF orientated projects in some detail. All up, a good site for the more RF inclined surfer; it's just a shame that each page takes so long to load...



**I'VE AVOIDED MENTIONING** newsgroups in Webwatch up until now because (a) I don't have access to a news server from the ISDN link on my desk, and (b) there are so many news groups out there (there's a

news group on just about every subject you can think of — literally), that there's no guarantee that your ISP will subscribe to any of the groups I mention.

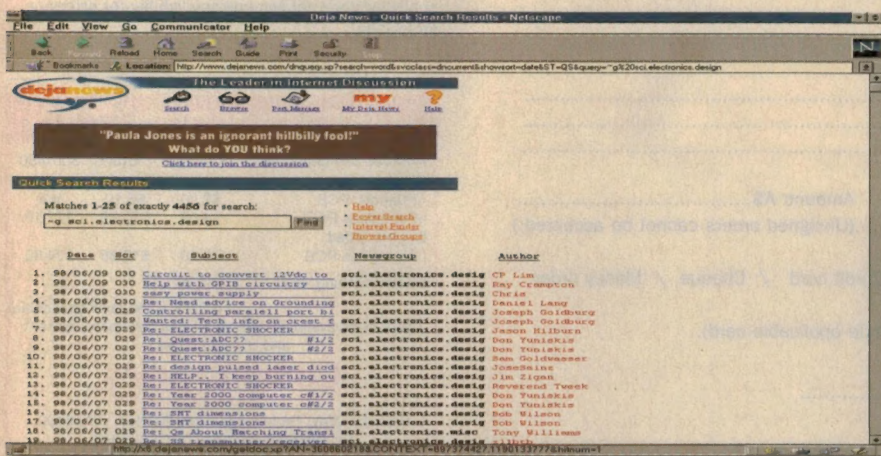
It was pointed out to me recently, however, that Dejanews (<http://www.dejanews.com>) gives newsgroup access to anyone on the web, and with a simple and unobtrusive registration you too can be reading what people have to say in the sci.electronics.design, group, or even the interestingly named rec.radio.amateur.boatanchors.

If you haven't looked at newsgroups before, I should warn you that you'll only see messages from people who feel strongly enough about the subject to post a message — and not all sites are moderated, so please take everything with a grain of salt.

**IF YOU REPAIR** electronic equipment for a living, there's a couple of sites which offer servicing hints and tips on the web, such as <http://ftp.cised.unina.it/pub/electronics/REPAIR/>, which is the Sci.electronics.repair FAQ I mentioned a couple of months ago.

<http://elmswood.guernsey.net/> is a site run by Paul Domaille, a Computer Engineer and Engineering Director, and it offers a fair number of hints and tips on repairing everything from computer monitors through to satellite systems.

There are separate sections on valve equipment, games machines, and even laser printer repairs, as well as a reasonably well stocked Engineers directory. As well there are several well written articles on servicing various items (such as lazer printers), all of which are well worth reading.



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# EA Directory of Suppliers

Which of our many advertisers are most likely to be able to sell you that special component, instrument, kit or tool? It's not always easy to decide, because they can't advertise all of their product lines each month. Also, some are wholesalers and don't sell to the public. The table below is published as a special service to EA readers, as a guide to the main products sold by our retail advertisers. For address information see the advertisements in this or other recent issues.

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## MAKE YOUR OWN PCB'S

Positive pre-sensitised	100x150	150x300	300x450
Single sided			
- Phenolic PCB	\$2.20	\$5.10	n/a
- Fibreglass PCB	\$4.55	\$10.85	\$22.10
Double sided			
- Fibreglass PCB	\$5.10	\$12.85	\$24.00
Heated Etching Tank	\$65.00		

(+22 % sales tax if applicable)

Other sizes available. We also stock developer, etchant and UV light boxes

**Computronics**  
Corporation Ltd

6 Sarich Way, Technology Park, Bentley, WA, 6102  
Ph. 08 9470 1177 Fax 08 9470 2844  
Other sizes at [www.computronics.com.au](http://www.computronics.com.au)



**SOLAREX BRAND SOLAR PANELS**  
These are professional quality solar panels with aluminium frame and glass cover and 1 year guarantee. 30W: \$290-80W: \$650



**NEW 12V SOLAR REGULATOR KIT**  
Our new regulator suits up to 100W panels. Features a current limiter so it can be used with car battery chargers, generators etc. Low cost due to the use of some unused recycled components. complete kit inc. case \$25... or \$20 with the purchase of one of our solar panels..

**FANTASTIC BARGAIN**  
**COMPUTER POWER SUPPLY PCB:**  
New assembly. 45 x 108 x 200mm. 120 / 230V AC input. DC outputs are +5V @ 6A, +12V @ 1A, -12V @ 1A, -5V @ 1A Data Inc. RU approval. Mains input. Be Quick!  
(Ps6) \$12 ea. or 4 for \$36

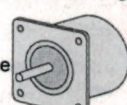


**CLEARANCE SPECIAL**  
**UHF AUDIO-VIDEO TRANSMITTER.**  
Your own mini TV broadcast station. Send video from VCR's or cameras to TVs in your home. Inc. Metal case telescopic antenna & leads. 12V operation, tunable (G01) \$20 or \$15 with camera purchase



**WE HAVE NEW STOCKS OF STEPPER MOTORS 30 oz./in. TORQUE, 2.5 DEG. (144 STEP), LOW VOLTAGE, COMPACT 57 X 38MM**

**TWO GREAT SPECIALS**  
**STEPPER MOTOR DRIVER KITS**  
**COMPUTER CONTROLLED STEPPER MOTOR KIT:** can drive larger motors with optoisolation. Inc. software and notes: \$50 or \$65 with two used 2.5 deg. motors!!



**STEPPER MOTOR DRIVER KIT** Kit inc. a large used 2.5 deg. (144 step / rev) motor & uses SAA-1042A IC. Controls inc. ext. clock, on-board clock logic CW or CCW rotation, half or full step, enable/disable, clock speed 1 motor: \$25 or 2 motors: \$35




**FRONT SURFACED MIRRORS**  
High quality mirrors 160x22x2.5mm. with some minor blemishes Ideal for laser & other optical projects \$5

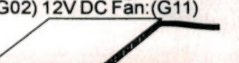
**TRANSISTOR SPECIALS**  
BU-205 HIGH VOLTAGE \$2.50  
2SD-1554 HIGH VOLTAGE \$5.00

**SPECIAL SPECIAL SPECIAL**  
**FOR \$1 EXTRA WITH EACH ORDER WE WILL SEND A WIRING KIT !!!**  
Great for cars, radios mobile phones, fog lights etc. 4 colours, 2 gauges of wire, Spade connectors, fuse holders, fuses. 17+ mtrs. of wire. Limited offer!!! just \$1

**TWO CHANNEL UHF REMOTE CONTROL** On freq. of 304MHz, transmitter is assembled, receiver is a kit, inc. 2 12V/12A relays, 1Tx + 1Rx kit: \$49, additional Tx: \$17



**SOLID STATE 4-6A PELTIER EFFECT COOLER/HEATER**  
3.3A @ 14V PELTIER: \$27, 6A @ 15V Peltier: \$35, both are approx. 40X40X4mm, can be temperature controlled by reducing supply voltage/current, will even work from a 1.5V battery!! We supply Peltier Effect device, data sheet, diagram & circuit for a small fridge / heater. Other requirements: Insulated box, 2 large heatsinks, & a small aluminium block. This device is used in the common 15Lr car fridge. Peltier effect Device + (G02) 12V DC Fan: (G11)



**OATLEY ELECTRONICS**  
PO Box 89 Oatley NSW 2223  
Ph (02) 9584 3563 Fax 9584 3561  
orders by e-mail: oatley@world.net  
http://www.ozemail.com.au/~oatley  
major cards with ph. & fax orders.  
Post & Pack typically \$6


**KIT OF THE MONTH**  
**AUTOMATIC LASER LIGHT SHOW KIT: MKIII.** Similar to the kit as published in Silicon Chip May 96 issue. The display changes every 5 - 60 seconds, the time is manually adjustable. For each of the new displays there are 8 different possible speeds for each of the 3 motors, one of the motors can be reversed in rotation direction, and one of the motors can be stopped. There are countless possible interesting displays which vary from single to multiple flowers, collapsing circles, rotating single and multiple ellipses, stars, etc. Now with no more mirror and motor alignment hassles with motor mounting on the PCB and mirrors now align with "Allen Key". Kit includes PCB, all on board components, three small DC motors, mirrors, precision adjustable mirror mounts : (K83) \$69



**FREE ADS ON OUR WEB SITE**  
On a trial basis we are offering Free advertising on our Web site for both COMPANIES AND PRIVATE INDIVIDUALS. Recently our web pages received more than 25,000 hits per week!!! Where else can you get so much exposure in the right place for FREE. Just E-mail us your ads. with the words "Free Ads" in the subject box and we will do the rest.  
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Oatley Electronics reserve the right to refuse to except any advertisements we deem unsuitable for our web sight


**COMING SOON**  
**HIGH POWER IR TRANSMITTER AND RECEIVER PAIR. APPLICATIONS INCLUDE DATA TRANSMITTER, IR INVISIBLE FENCE/GATE AND DOORWAY MONITOR. RANGE: PASSIVE MODE 10M, ACTIVE MODE 40M ALL FOR UNDER \$30**

**HIGH RESOLUTION MONITOR**  
Brand new 240V 30cm enclosed computer monitor + video conversion kit. Gives better resolution than TV! Limited good qty. BARGAIN PRICE.



**MODEL TRAIN CONTROLLER KIT:**  
Ref: SC Jul 95. This allows two trains to be run on one loop of track, without hitting each other due to speed differences. When the train breaks an infra red beam it switches off the power to a portion of the track, until the other train catches up and breaks another beam at another location. Circuit uses a relay to switch these two sections of the track. Main PCB: 96 x 66mm, Infra Red Sensing PCB's: 59 x 14mm: (K58) \$28

**\$2 \*\* YES \*\* \$2**  
**VHF VIDEO 1-2 MINI MODULATORS WITH EVERY CAMERA YOU BUY OR HAVE BOUGHT IN THE PAST INC DATA SHEET: \$2 (Rm2).** This unit will fit neatly with our camera in our 50x50mm case + swivel mount strong adjustable universal bracket: \$4 Bracket only: \$1.50

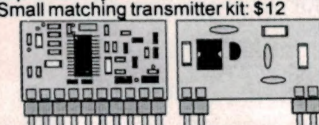


**SPECIAL BARGAIN**  
**12V/7Ah GEL BATTERY BARGAIN**  
Fresh stock of NEW standard battery \$22

**NEW! 4ch. UHF LEARNING REMOTE**  
Can be programmed as a spare for your current remote or to replace up to 4 other units and combine into 1: (TX1) \$39



**UHF DATA TRANSMISSION**  
Stamp sized Xtal locked 433.9MHz superhetrodyne receiver module \$25 Small matching transmitter kit: \$12



**COMING SOON**  
**12VDC-240AC INVERTER**  
FEATURES INCLUDE MODIFIED SQUARE WAVE OUTPUT, AUTO START WITH LOAD SENSING, USES SIX POWER MOSFETS. 200 - 600VA. TO SAVE MONEY YOU CAN REWIND YOUR OWN TRANSFORMER. BASIC KIT INCLUDES PCB AND ALL ONBOARD COMPONENTS FOR AROUND \$30. E-MAIL US FOR MORE DETAILS

**HIGH QUALITY DC MOTORS**  
3V - 8V DC motors with feedback winding for speed sensing ect. 40mm diameter X35mm long \$3

**PROFESSIONAL REVERB**  
Large studio quality, three spring units. Dim.: 425 x 110 x 33mm. Input Z = 190 ohms, output Z = 2.6 k ohms, recommended AC drive = 6.5 mA. A circuit diagram of a stereo pre-amp tested using this unit: \$40 (A10)




**CCD CAMERA SPECIAL**  
The best "value for money" CCD camera on the market! 0.1 lux, High IR response & high res. Performs better than many cheaper models. WITH A CHOICE OF 1 OF THESE LENS Pinhole (60deg.), 78 deg.; 92 deg.; 120 deg.; \$89 or 150 deg: \$99



**HALF PRICE SUPER SPECIAL**  
LM338 adjustable ( TO3 package ) 5A voltage regulator with internal overload protection, plus application notes for a variable 1.2V- 33V 5-20A power supply. Half price at just \$6 Ea or 4 for \$16

**UHF GARAGE REMOTE CONTROL RECEIVER:** Ref: SC Dec 93. All the required electronics for UHF remote control of DC motors to operate garage doors, gates, and shutters. Provision for upper and lower limit switches, and has motor current sensing that will cause the motor to stop if the door hits an obstruction (this feature can also be used to eliminate limit switches). Circuit includes a 2 minute timer with a MOSFET switch for operating a 12V courtesy light. Security code has over 1/2 million combinations. Receiver uses the pre-aligned UHF receiver module. Use either 1 Channel Transmitter (K41) or 3 Channel Transmitter (K40). PCB and all on-board components kit for the receiver only: (K23) \$75...12V wiper motor for only \$10

**IR RECEIVER FRONT END MODULE**  
This device contains an IR receiver diode, an amplifier tuned to 38KHz, a bandpass filter, an AGC section & detector circuit. \$2 Ea or 10 for \$15




**AMP-PREAMP & MORE**  
A professional mostly Surface Mount PCB WITH a TDA1905 5W amp. IC & audio pre-amp section. We also provide a pre-wired high quality unidirectional electret mic. that has a wind filter & clip. A small speaker & hook up info. Appears to have been designed for a comms. system. Great applications including a two way intercom (2 req.) no switching require 1: (Ap3) \$10 each or 2 for \$18.

**PLASMA DISPLAY BALL KIT:**  
High Power High Frequency EHT generator that will give an exciting plasma discharge with a std light bulb or make Jacobs Ladder or Ladden Jar & other EHT applications. Can be converted to a DC. Supply with a HV diode. Inc. EHT transformer + PCB + all on-board parts & 1KV fast Diode + application notes. Req 12V @ 0.5-2A. Special price \$29. 16KV. Diode \$1.50



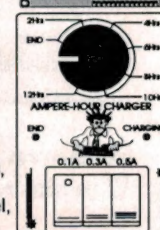
**GET THEM BEFORE THEY GO**  
**HELIUM - NEON LASER TUBE & SUPPLY KIT:** Helium Neon 633nm red laser heads Great for light shows or holography. 2-3mW. Inc. a special high voltage supply. Tube & supply: (L03) \$80 This KIT requires 12V @ 2A. WARNING!!! INVOLVES HIGH VOLTAGE & VERY BRIGHT NOT FOR USE BY CHILDREN!! ALL LASERS MUST BE USED UNDER COMPETENT SUPERVISION.



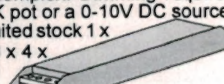
**BRAND NEW STD LCD DISPLAYS**  
1 line x 16 char.: \$16  
2 line x 16 char. with LED back-light: \$24



**AMPERE-HOUR CHARGER KIT**  
Just set the required Amps - 0.1, 0.3, 0.5 and the time. Shuts off automatically. Charges any cell or battery from 0 - 15v. supplied with all parts, box, knob, switches, plug-pack, timer, label, PCB & all components: \$18



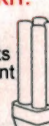
**CLEARANCE SPECIAL**  
**FLUORESCENT LIGHT HIGH FREQUENCY BALLASTS**  
European made, new, "slim line" case high frequency (HF) electronic ballasts. Flicker free starting, long tube life, high efficiency, visual flicker during operation. Reduced radio frequency interference. Similar design to one published in the Oct. 94 Silicon Chip, although these are much more complex. Dimming requires external 100K pot or a 0-10V DC source. We have a limited stock 1 x 36W tube, 28 x 4 x 3 cm: (G09F) just \$18



**SUPER SPECIAL**  
**60 NEW Flat NiCad FOR \$10**  
Space saving batteries 16X48X5.5mm With solder tags



**CFL AND BALLAST INVERTER KIT:**  
Power efficient fluorescent 12V lighting. Unlike cheap commercial fluorescent tube drivers, our kit gets long life from tubes & is very efficient. It simply generates DC @ around 250V-350V at up to 40W CFL's. (K111) \$27-Extra CFL's \$12



**NOTICE TO CFL KIT BUYERS**  
**PRIOR TO 1/6/98**  
In some kits that were sold before 18/5/98 one or both FETs run hot due to different tolerances of Ic1. Please contact us for details on a mod to fix this problem.



# Where do you GO for the last word in telephones...



## Privacy switch

Ensure no-one listens into your phone conversations.

F 2804

**\$9<sup>90</sup>**



## Message stopper

Automatically switches off answering machine when you pick up.

F 2807

**\$9<sup>90</sup>**



## Voice and data leads – Cat 5

For fast transmission. Leads in a range of lengths to suit you.

**FROM  
\$9<sup>90</sup>**



## Visual ringer/amplifier

Flashing light indicates an incoming call. Features adjustable volume and tone.

F 5125

**\$29<sup>90</sup>**

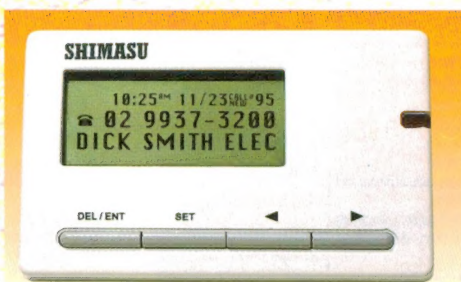


## Ringmax ringer

Select your own telephone ring. Stop confusion as to which phone is ringing!

F 5400

**\$49<sup>95</sup>**



## Callback Caller ID unit

With one touch call-back. Displays caller's name\*, number, date and time of call with a "New Call" symbol for calls which have

not been reviewed before. Stores 99 numbers.  
12 month replacement warranty.

F 5223

**SHIMASU**

**\$59<sup>95</sup>**



## Caller ID phone

Speakerphone with large Caller ID screen. Stores last 50 callers' numbers, and dates of calls. Handsfree, onhook dialling, timer and clock.

F 5276

**\$199**

**Telstra**



## Digital answering machine

Includes Caller ID storage of 72 names and numbers, 14 minute recording time and 3-line backlit display. Upright design for easy viewing.

F 7704

**VOXSON®**

**\$139**

## Cordless caller ID

Know who's calling wherever you are with this fully featured phone. Caller ID display on the back of the handset.

F 7247

(\$20 cashback redeemable from Uniden).

**\$20 CASHBACK**

**\$229**

**Uniden®**



## PHONE FAX & MAIL ORDERS

**PHONE:** 1300 366 644 (Local Call Charge) **FAX:** (02) 9395 1155

**MAIL:** DICK SMITH ELECTRONICS, Direct Link Reply Paid 160,  
PO Box 321, North Ryde NSW 2113 (No Stamp Required)

Please add postage (up to 5kg) to your order, as follows:

• \$4.00 Up To \$50 • \$7.50 \$51 Up To \$100 • \$9.00 \$101 Up To \$500 • \$11.00 over \$500  
(quote available for air/road freight or if over 5kg) email: dse.directlink@bigpond.com (enquiries only)

• Major Credit Cards Accepted. • Gift Vouchers Available

**direct link**

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ELECTRONICS**

*That's where you go*

For further information, orders or the location of your nearest store call:  
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Or Fax: (02) 9395 1155